OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

(OTTAWA, CEDAR POINT, DARBY, NAVARRE NWR'S)

OAK HARBOR, OHIO

ANNUAL WATER MANAGEMENT PROGRAM

1988

NATIONAL WILDLIFE REFUGE SYSTEM
FISH AND WILDLIFE SERVICE
U.S. DEPARTMENT OF THE INTERIOR

OTTAWA NATIONAL WILDLIFE REFUGE COMPLEX

ANNUAL WATER MANAGEMENT PROGRAM

REVIEW AND APPROVAL

Michael Tansey
Prepared by

1/29/88
Date

Regional Refuge Supervisor, Div. 1

3/3/88
Date

TABLE OF CONTENTS

WATER MANAGEMENT PLAN - 1988

This annual water management plan for Ottawa NWR Complex provides for water levels after a record high lake level year and when many dikes will be repaired with newly aquired emergency flood damage money.

The record high water levels for lake Erie for the last two years finally started to recede in 1987. Unfortunately, even at their lowest point in November, lake levels remained a full foot above average. They were ~~a~~ two feet above average during the critical period in April and May when many units were scheduled to gravity drain. The outlook for Lake Erie, according to the Corp of Engineers, is for the lake to remain a foot below the 1986 record highs (which is still 1 1/2 feet over the lake average), at least until July, 1988.

Most refuge facilities were built during the normal or low years (with the exception of the 1972-73 period) and getting enough water to raise water levels in wetlands was a problem. Northeast storms have always been a problem but overall water levels have been near normal the last 25 years. In the mid to late 1970's energy conservation was a factor in the design of water control structures. Dual flap gates on screw gates that faced in opposite directions were installed. Gravity was all the energy that was needed and the system worked well during those years. The key was to have a water source that periodically fluctuated and wind tides on Lake Erie cooperated with each blow from the southwest and northeast.

With record high water levels in 1986, several adverse impacts occurred. Gravity control structures did not work, severe erosion took place on all unprotected dikes, and defects in dikes and control structures showed up. Four breaks had to be repaired in 1986. Muskrat and groundhog damage to dikes becomes more apparent as the dikes narrow from erosion and water pressure finds many of the burrows. Defects on pipes or gates become more serious as the pressure from the high water tests their utility. Carp find those dike leaks and can wallow several feet of dike in short order.

Due to the inability to gravity drain, hundreds of acres of emergent vegetation has drowned. At Darby and Cedar Point NWR the high water level damage is most apparent. High water levels in 1985 eliminated and stressed hundreds of acres in both units. Continued high water in 1986 drowned most of what survived 1985. Fortunately, both of these units were lowered enough in 1987 to regain some of the lost vegetation.

To combat the deteriorating effect the recent high lake levels have had on refuge dikes, 5 million dollars has been appropriated for dike repair and installation of two pumping stations. Much of the construction will start in 1988, which means that certain units will be drawn down and remain dry until construction is complete. Units affected by construction this year in order of importance are MSU 3, Pool 1, MSU 7A-B and possibly Cedar Point-Pheasant Farm. Pumping stations are planned for Cedar Point and Darby.

An undesirable aspect of the construction and drawdowns associated with it is the expansion of the purple loosestrife infestation that we are already hard-pressed to control. The lower water levels this year facilitated its spread in several units (especially the Pheasant Farm). However, after two years of high water levels, it was essential to lower the water levels to revegetate drowned areas. Possible purple loosestrife expansion was taken under consideration, but was deemed an unavoidable hazard that must be risked, or lose the emergent vegetation in the units. Private wetlands and state parklands adjacent to the refuge are heavily infested and provide a constant source of re-infestation even when control actions are effective in removing adult plants. Overall, the refuge is slowly losing the battle. All major divisions of the refuge are at least slightly infested. Control expenditures at the level of the past few years is slowing the spread and stopping a rapid takeover.

Future plans to combat the pest include purchasing an airboat in FY88 and early summer evaluations of drawdown areas. If the money cannot be found in next year's budget to get the airboat, the purchase will have to be put off for another year and Ottawa will again be forced to borrow one from another refuge. The evaluations simply involve checking drawn down areas for purple loosestrife germination. If an unacceptable density or acreage of the marsh becomes infested, it can be reflooded to drown the small plants.

Another aggressive aquatic plant of concern is Phragmites. Phragmites started out in several units as small clumps, but has steadily increased the acreage it dominates. If it continues to expand at this rate, it may become a serious problem in Cedar Point-Pool 2 and the Show Pool.

No aerial photographs were taken this year. Unfortunately, the pilot was unable to make the flight due to a mandatory maintenance check. To help document future changes in the marsh, ground photography points were established. A volunteer with extensive photography experience will photograph the units from these points once a year.

In an effort to improve our wetland management techniques and abilities, the refuge has purchased more water level guages, water quality measuring equipment and is investigating new pesticide application techniques. Fifteen water guages were bought for $550/each. The 9 metal pilings that they will be mounted on cost $2,300 dollars to buy and install. The guages will be attached to the pilings before the ice becomes unstable in March. These newly installed guages will allow us to monitor the water levels closer. Water quality equipment was purchased to monitor for potential problems in pH, alkalinity and turbity, all of which affect duck production by affecting invertebrate populations. A new pesticide application technique will be attempted in 1988 to control the willow/cottonwood stems that plague the moist soil units. The technique consists of pulling a modified wick applicator behind a 4-wheel ATV over the ice when only seedlings are left standing. The modified wick applicator utilizes a piece of carpeting wrapped around the PVC pipe instead of nylon rope. This method will be done on a small, experimental marsh the first year using a pesticide with a short term residual. The herbicide should be applied when the stems are not frozen, yet the ice is strong enough to hold the ATV. Wick applications of Rodeo on woody growth will also be done in May using the ATV.

Also under consideration for next year is a carp control program. At this time, most of the units and pools are populated with carp. Even those units that are drawn down as dry as possible have sufficient numbers of carp survive in ditches or barrow areas to repopulate the following year. In the future, pools will be drawn down completely, so that no water is left ~~is~~ in shallow pools, barrow pits or ditches to insure that the resident population is extirpated. All incoming water will be screened to reduce the chance reintroduction of the carp into the pool. Also under consideration is the use of rotenone to kill carp in areas that are difficult to drain.

Another experimental program for 1988 is to propagate giant burreed, soft-stem bulrush, threesquare and Walter's millet to improve the quality and diversity of the marshes. These plants will be introduced by transplanting bulbs and tubers, and by planting the Walter's millet seeds gathered last year.

Unit Objectives Summary for 1988

Ottawa NWR

Pool 1 - Gravity drain/Crisafulli drawdown for flood damage construction and revegetation of open water areas.

Pool 2A - Crisafulli drawdown to encourage emergent vegetation.

Pool 2B - Crisafulli drawdown to wet stage to encourage emergent vegetation while still stressing cottonwood seedlings.

Pool 2C - Allow precipitation to fill unit, then hold water level just high enough to kill cottonwood seedlings.

Pool 3 - Open to the lake - not covered.

Pool 4 - Open to the lake - not covered.

Pool 5 - Open to the lake - not covered.

Pool 6 - Hold water high to encourage muskrats to open dense cattails.

Pool 7 - Open to the lake - not covered.

Mini-Marsh - Gravity drain to encourage moist soil plants - shallow flood in fall.

Show Pool - Crisafulli drawdown to repair water control structure and for moist soil plant production.

Entrance (HQ) Pool - Drawdown to repair N dike - shallow flood in fall.

MSU 3 - Drawdown with MS pump for major dike repairs - cooperatively farm part of the unit with woody problems.

MSU 4 - Drawdown to wet/moist stage to encourage MS plants - reflood in fall.

MSU 5 - Drawdown with moist soil pump to wet/moist stage to put rock on N dike and for moist soil plant production.

MSU 6 - Open to the lake - not covered.

MSU 7A - Drawdown with farm pump for flood damage construction - cooperatively farm part of the unit.

MSU 7B - Drawdown with farm pump for flood damage construction and access to barrow area - cooperatively farm rest of the unit.

MSU 8A - Crisafulli drawdown to encourage moist soil plants.

MSU 8B - Drawdown with farm pump for moist soil plants.

Navarre

Pool 1 - Drawdown by Toledo Edison pumps for moist soil plants and to encourage emergents.

Pool 2 - Drawdown by Toledo Edison pumps for moist soil plants - shallow reflood in fall.

Darby

Pool 1 - Partial drawdown through July - reflood July 15th for purple loosestrife control.

Pool 2 - Hold water high to discourage purple loosestrife - drain if neccessary to place new pump.

Pool 3 - Gravity drain starting March 15th - Pump out what is left by May 15th.

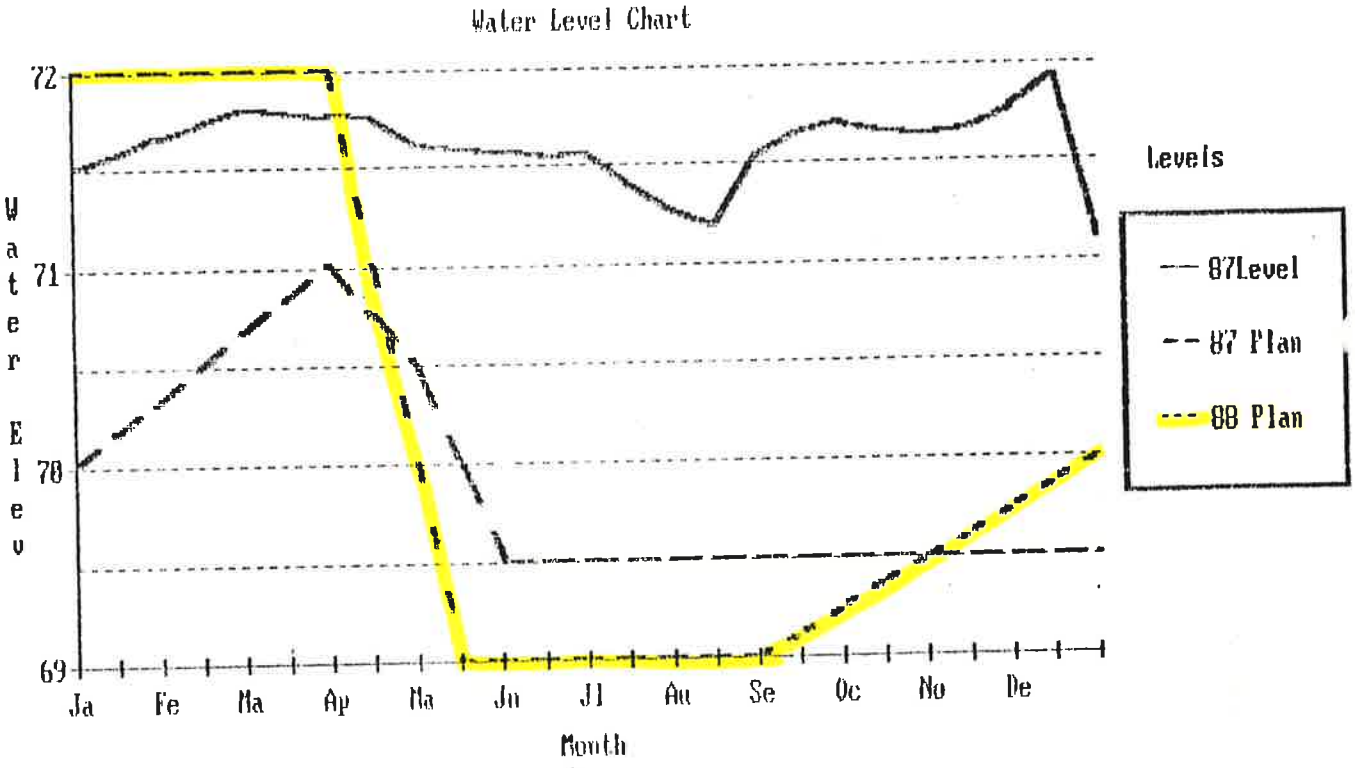
Pool 4 - Start to gravity drain by March 15th - pump drain ditch if it is neccessary for construction.

Cedar Point

Pools 1 & 2 - Gravity drain to planned low by mid to late May - allow precipitation to refill the unit to provide access for purple loosestrife control.

Pheasant Farm - Partial drawdown in early March until water is off the face of eroding dikes - allow precipitation to refill the unit to provide access for purple loosestrife control.

1. Unit Pool 1
2. Acres 275
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	75	65	60
Cattail	10	15	15
Aquatic Smartweed	10	10	10
Smartweed	0	5	5
Other	5	5	10

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	4,200	30,000	50,000
Geese	2,200	4,000	10,000
GBH	1,000	2,000	2,500

9. Purple Loosestrife: Slight to moderate infestation of plants scattered throughout unit. They were sprayed with the airboat.

Pool 1

A.2 Effects of Past Year's Water Levels

Levels: High lake levels and the high cost of pumping prevented the lowering of the water levels. The surface elevation remained 1-2 feet above the planned level throughout the year.

Results: Even with the high water levels, the 1987 objective of maintaining vegetation was met. However, more damage was done to the dikes as a result of wave action.

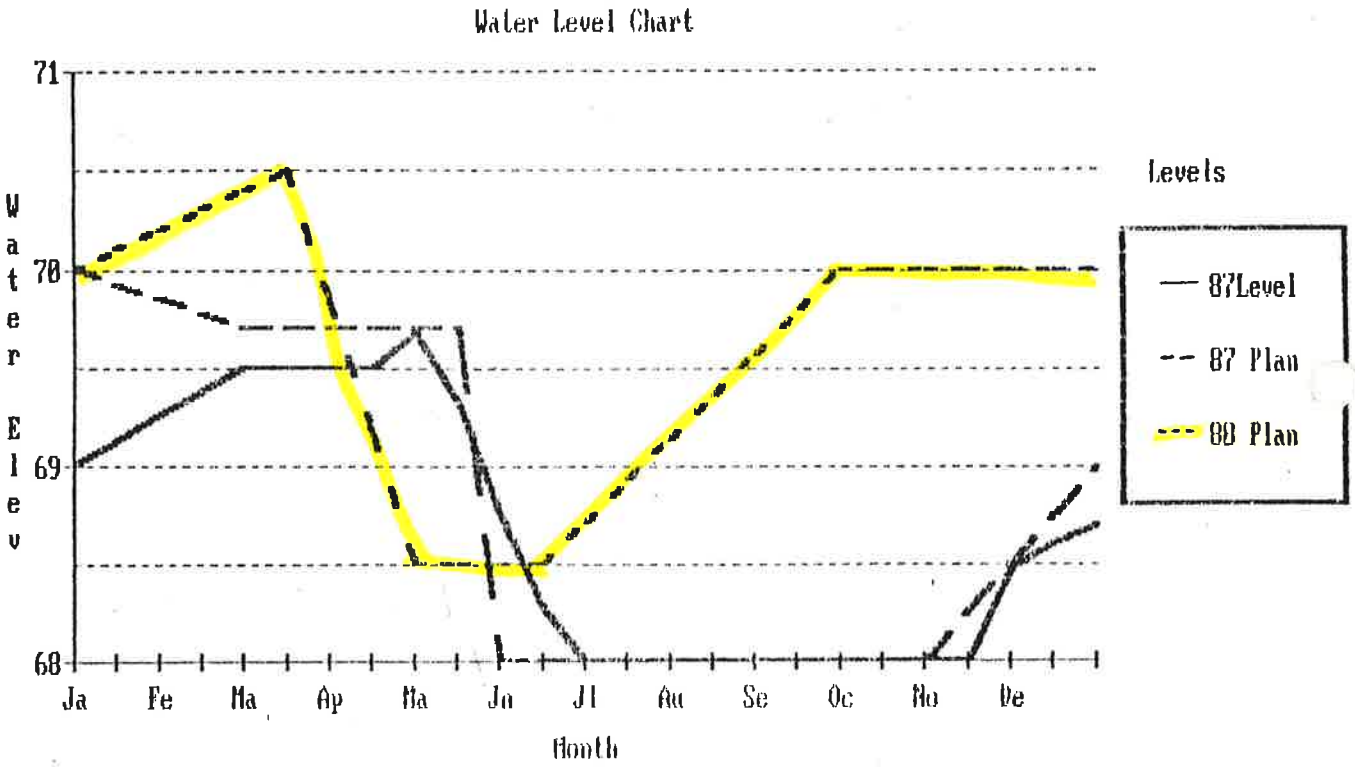
Facilities: The WCS in the SE corner is completely silted in and requires replacement. The NE and S dikes are 70% to 90% lost to erosion with the SW corner 50% lost.

Costs: The west dike was mowed twice.

B.2 Objectives of the 1988 Proposed Water Levels

A complete drawdown coordinated with construction to vegetate the open N and S bays, and to create channels to connect the bays. The drawdown is scheduled to be completed by the third week in May via State pumps depending on State cooperation per agreement for pumping, and our ability to keep water to the pump.

1. Unit Pool 2A
2. Acres 70
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 568
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	87	50	20
Water	5	5	25
Mixed Forbes/Other	2	25	40
Smartweed/Velvet Leaf	5	20	10
Aquatic Smartweed	1	0	0
Mudflats/Bidens	0	0	25

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	1,500	25,000	40,000
Geese	3,000	15,000	20,000
GBH	300	1,000	1,000

9. Purple Loosestrife: Two plants found and sprayed.

Pool 2a

A.2 Effects of Past Year's Water Levels

Levels: No water was added in the fall of 86 or spring of 87, but precipitation added several inches. The unit was pumped down in May to facilitate dike repairs and digging of pump channels. The barrow areas and low areas on the SE and NE sections held water throughout the year. Precipitation started to fill the newly dug ditch in August and the bottom of the unit in November.

Results: Fair to moderate response occurred with some good but small stands of smartweed. Sweet clover and cottonwood seedlings dominated the higher ridges while the evaporation exposed mudflats contained beggers tick germinating late in the summer.

Facilities: The E, W and N dikes were resloped and rocked this summer with a pump channel draglined at the foot of the dike. The channel does not connect to the low area in the SE corner or to the barrow pits in the central areas, so much of the unit will continue to hold water until interconnecting channels are dug.

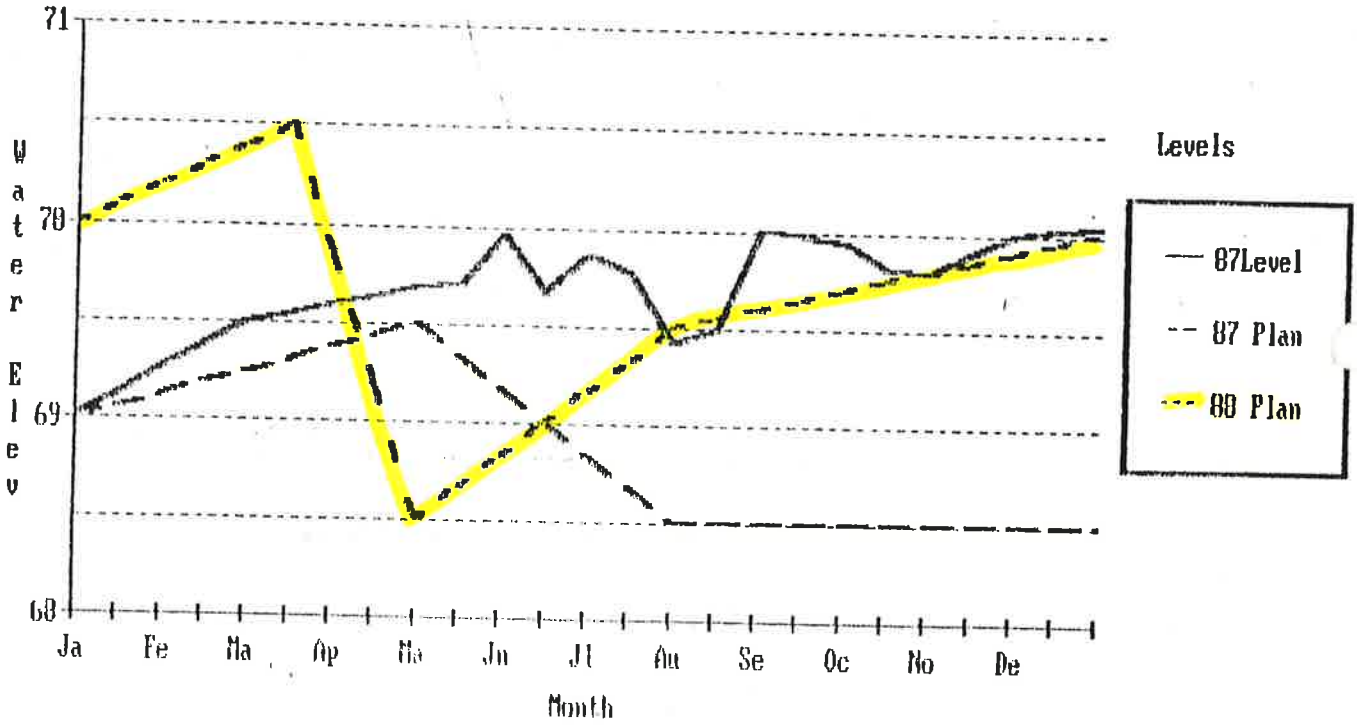
Costs: The total cost for the construction done on the dikes was $31,000. This includes rock, filter fabric, time put in by our equipment operator and the services of the dragline and operator. Total cost of pumping the unit down with the Crisafulli and Ford pumps was $600. The Ford pump was run 5 days for 8 hrs/day, and the Crisafulli - 3 days for 8hrs/day. Part of this unit was mowed in August.

B.2 Objectives of the 1988 Proposed Water Levels

Drawdown enough to keep the area wet to encourage emergent vegetation. Evaluate the area in early summer to determine if purple loosestrife has spread.

1. Unit Pool 2B
2. Acres 95
3. Maximum elevation permissible 572
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 568
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Cattail	1	2	3
Willow	8	8	8
Smartweed/Millet	62	40	25
Open Water/Cottonwood Seed.	8	40	45
Smartweed/Cottonwood Seed.	21	10	5
Bidens/Milkweed/Other	0	0	12

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	60,000	20,000	41,000
Geese	35,000	20,000	12,000
GBH	15,000	3,000	1,500

9. Purple Loosestrife: Area was surveyed, but none was found.

Pool 2b

A.2 Effects of Past Year's Water Levels

Levels: Water levels were only slightly higher than planned until May. The unit was not pumped down, so water levels reached 1 1/2 feet above planned levels by September and remained there for the rest of the year.

Results: Good stands of millet and smartweed developed in several areas. Marsh milkweed also developed in thick stands to shade out vegetation beneath them. Cottonwood stems still hung on in the deep areas and established another hold on the higher ground on the east end.

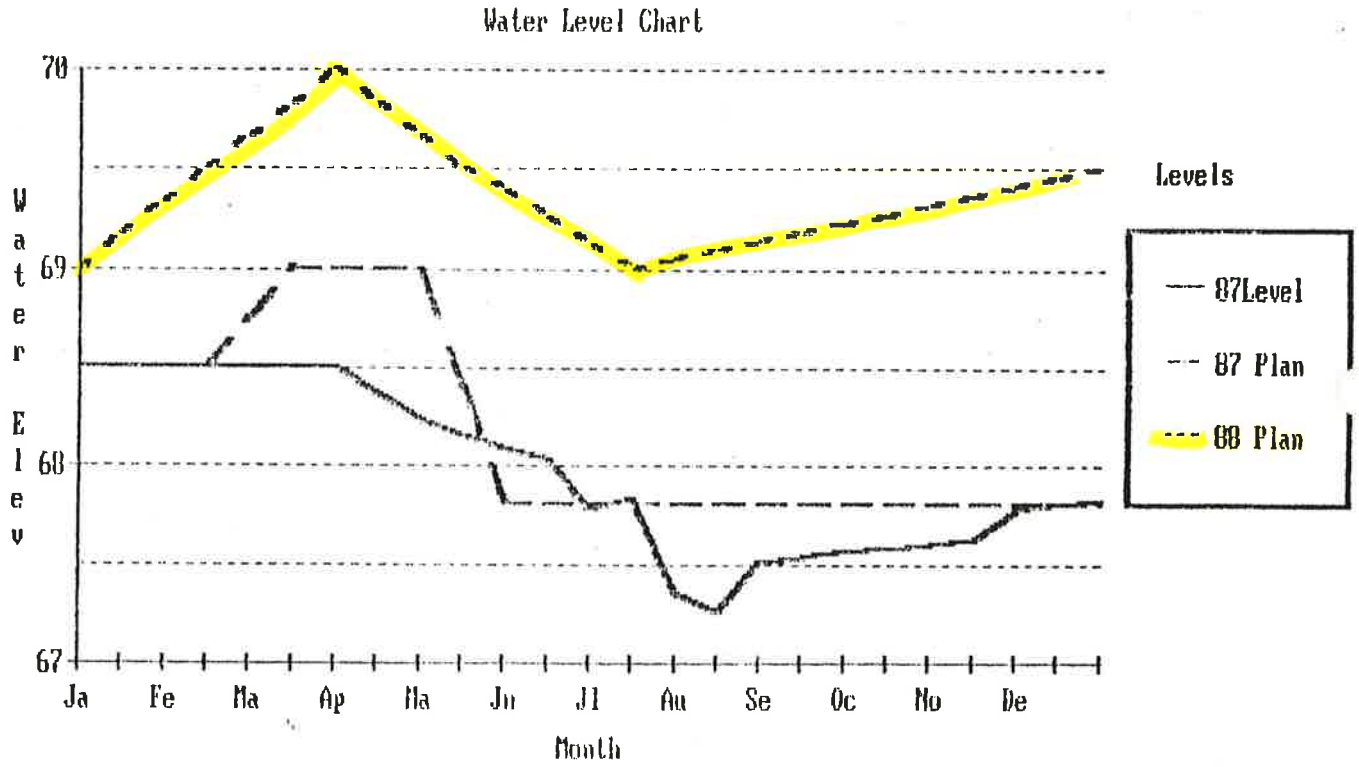
Facilities: The high water caused more erosion at the toe of the N dike. The E dike was built up with dragline and sloped with the grader. Brush was mowed along the dikes.

Costs: The east dike was draglined, sloped and graded. No pumping was done in 1987.

B.2 Objectives of 1987 Proposed Water Levels

Water levels will be kept shallow to wet to encourage emergent vegetation and kill cottonwood stems in the bay. The area will be evaluated throughout the summer to judge vegetation response.

1. Unit Pool 2C
2. Acres 80
3. Maximum elevation permissible 571
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Aquatic Smartweed	3	0	0
Smartweed	75	20	10
Cottonwood Seedlings	19	0	0
Millet/Other	0	50	50
Open Water/Cottonwood Seed.	3	30	40

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	30,000	10,000	42,000
Geese	15,000	20,000	25,000
GBH	20,000	3,000	2,500

9. Purple Loosestrife: Unit was surveyed, but none was found.

Pool 2c

A.2 Effects of Past Years Water Levels

Levels: The unit was gravity drained in April. The water elevation dropped even further during the summer months due to evaporation. No water was added via WCS and precipitation partially filled the unit in fall.

Results: Smartweed/millet response was moderate with excellent stands developing along the margin of the deeper bay. A mixture of millet and other less desirable species developed over 1/2 the unit. Cattail seedlings were noted around the bay and in the S part of the unit.

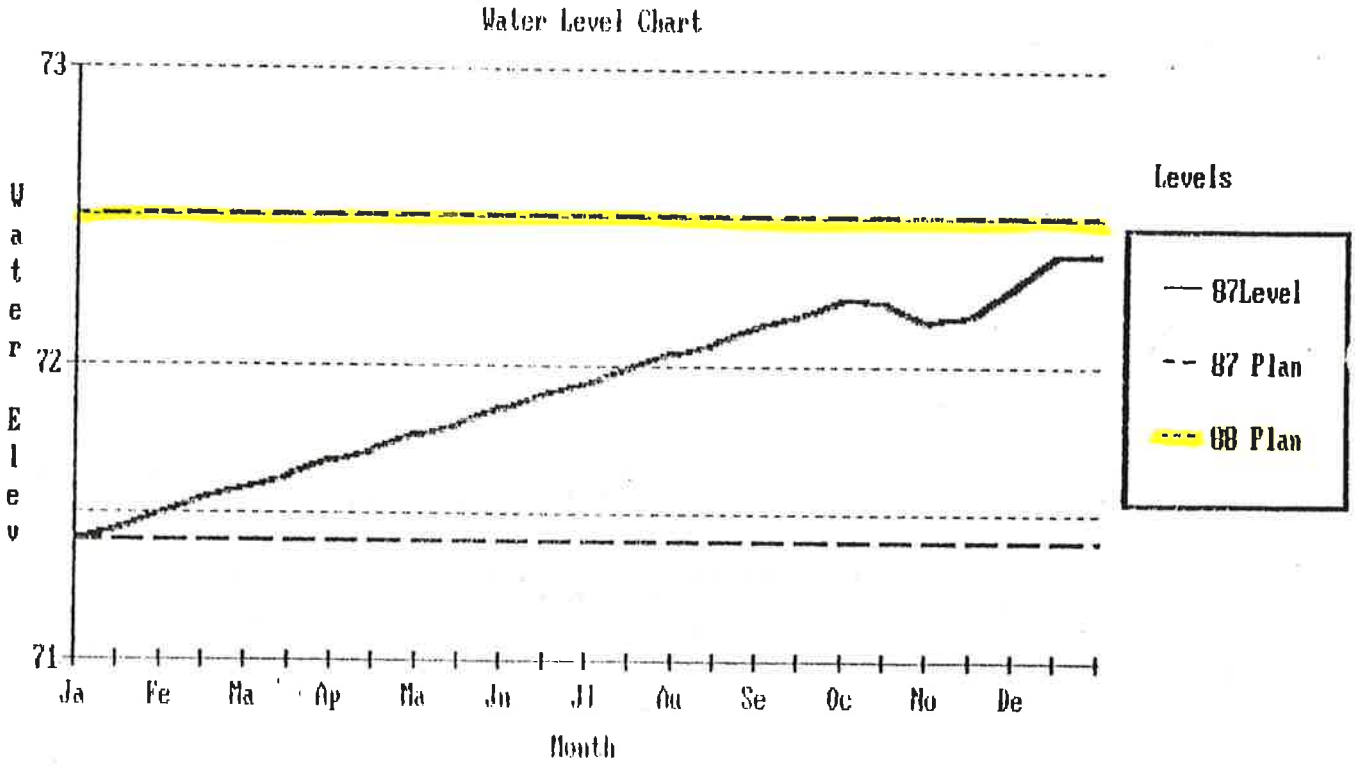
Facilities: Only a 300' section of the S dike still requires rip rap. This job will be completed in 1988.

Costs: None.

B.2 Objectives of the 1988 Proposed Water Levels

Flood the unit by early May until the highest ridges are soggy to wet. The deeper water in the bay will set back cottonwood growth, yet allow desired emergents to grow in the shallower areas.

1. Unit Pool 6 (Woodies Roost)
2. Acres 160
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	45	50	50
Wooded	10	10	10
Cattail	45	40	40

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	unknown	unknown	10,000
Geese	" "	" "	20,000
GBH	" "	" "	2,500

9. Purple Loosestrife: Area surveyed - one large clump found and sprayed just south of dike.

Pool 6 (Woodies Roost)

A.2 Effects of Past Year's Water Levels

Levels: Water levels were kept stable and high this year by retaining last year's high water and allowing precipitation to fill the unit even further.

Results: The muskrat population is beginning to riddle the dense cattail with openings.

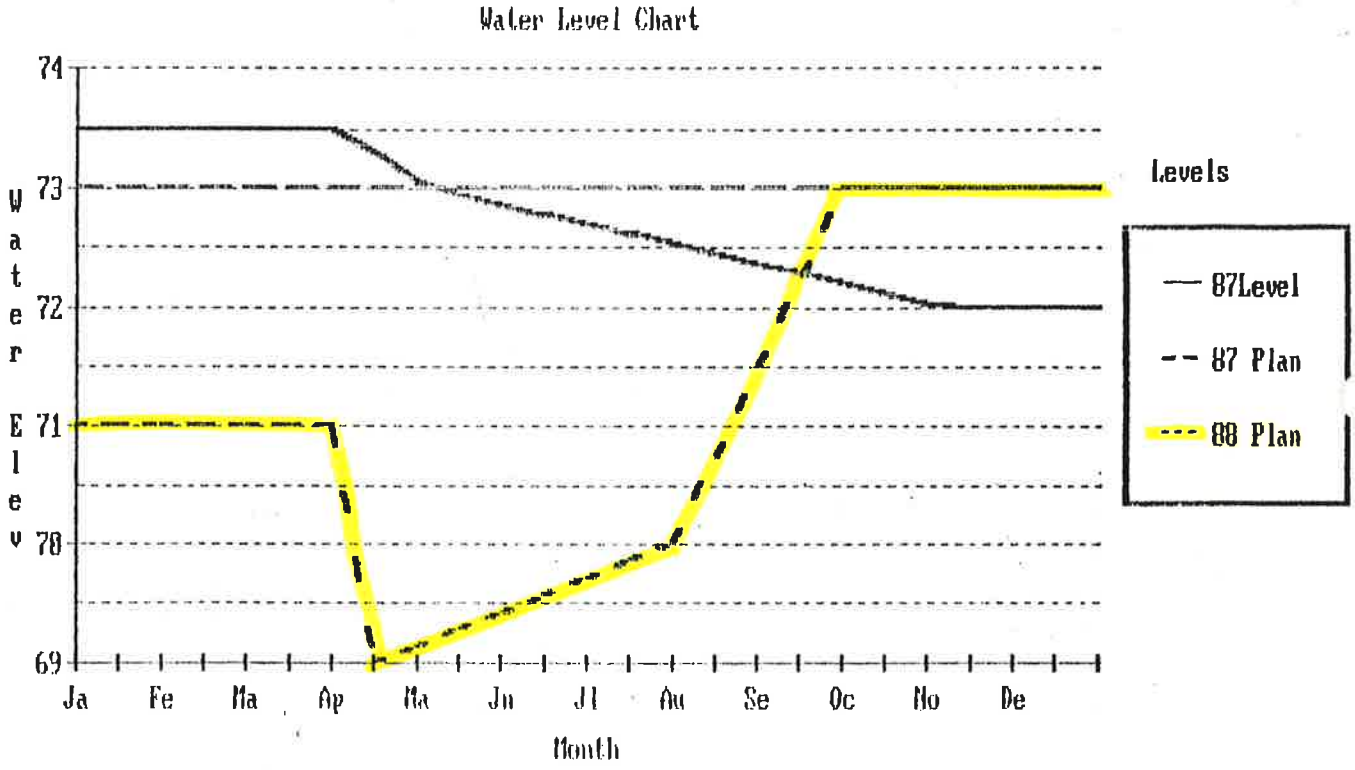
Facilities: A detailed evaluation of the condition of the dikes has not yet been done. Some erosion of the north dike and rat holes on the north, west, and south dikes are a problem.

Costs: None

B.2 Objectives of the 1987 Proposed Water Levels

Water will again be held high this year to allow the muskrat population to build and open the dense cattail stands along the pool's edge. Enough water will be held over from winter and spring precipitation so that we will not have to depend on the state to raise the level of their canal to take on water.

1. Unit Show Pool
2. Acres 30
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 572
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	16	20	35
Cattail/Bulrush	10	20	5
Wet Meadow	64	30	10
Cottonwood	10	10	15
Submergents	10	20	25
Phragmites	0	0	15

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	1,000	5,000	8,000
Geese	3,000	3,000	7,000
GBH	500	1,500	1,000

9. Purple Loosestrife: Scattered plants sprayed along dikes.

Show Pool

A.2 Effects of Past Year's Water Levels

Levels: Water Levels were kept as high and stable as possible during the first part of the year. However, as high lake levels receded in late October, the water control structure proved to be faulty, and the pool drained. Water remained only in the ditches and barrow pit area. Precipitation started to fill the pool after the lake levels rose enough to keep the unit from draining.

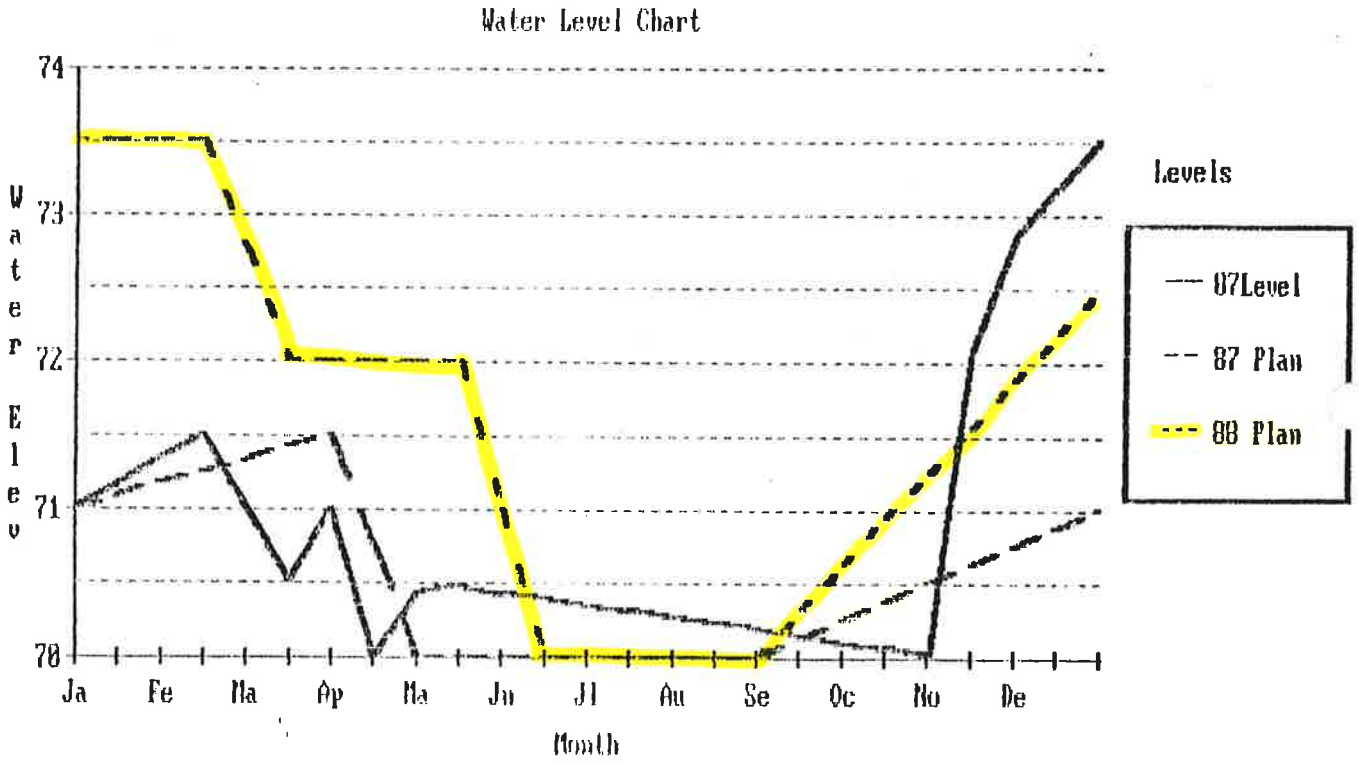
Results: The objective of stressing/killing cottonwood and willow was partially successful. Although no willow was killed, some begin to show signs of stress. The taller cottonwoods are beginning to die back and blow over during strong winds. Cattail was knocked back, while phragmites dominated where the cattail was before. High levels in the Show pool forced high water on the woods adjacents to the office, causing considerable pumping to keep them dry.

Facilities: A 100' section of the N dike is moderately eroded as are sections of the E dike. Leaks through the S dike kept the trees around the shop and office flooded too long in summer. Pumping costs to keep these woods dry - $200.00.

B.2 Objectives of the 1988 Proposed Water Levels

A complete drawdown by early May is planned to repair the WCS. The date of drawdown will hinge on the repair work scheduled for Radar Ditch. Other work to be completed include spraying willow with Rodeo, bulldozing the bigger trees and evaluating carp control.

1. Unit Entrance (HQ) Pool
2. Acres 30
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	33	10	20
Cattail	33	35	50
Wet Meadow	34	35	20
Smartweed	0	20	0
Willow/Brush	0	0	10

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	4,000	15,000	10,000
Geese	20,000	20,000	8,000
GBH	2,500	3,500	1,000

9. Purple Loosestrife: Infestation downgraded to slight along wetland margin. More winged loosestrife found than purple - only scattered individuals remain.

Entrance Pool (Headquarters Pool)

A.2 Effects of Past Year's Water Levels

Levels: Water levels dropped by foot in March by gravity drainage, went up 6 inches due to the spring rains, and were drawndown again via Crisafulli pumping by April 15. Precipitation increased the level until late October. At this time, the unit was drawndown again to install a flapgate.

Results: Excellent millet response between the water's edge and cattails. The willow stands on the east side of the unit are expanding, and should be controlled before they get too big. For its size, this unit had good duck use throughout the year, and excellent shorebird/egret use while the unit was drawn down.

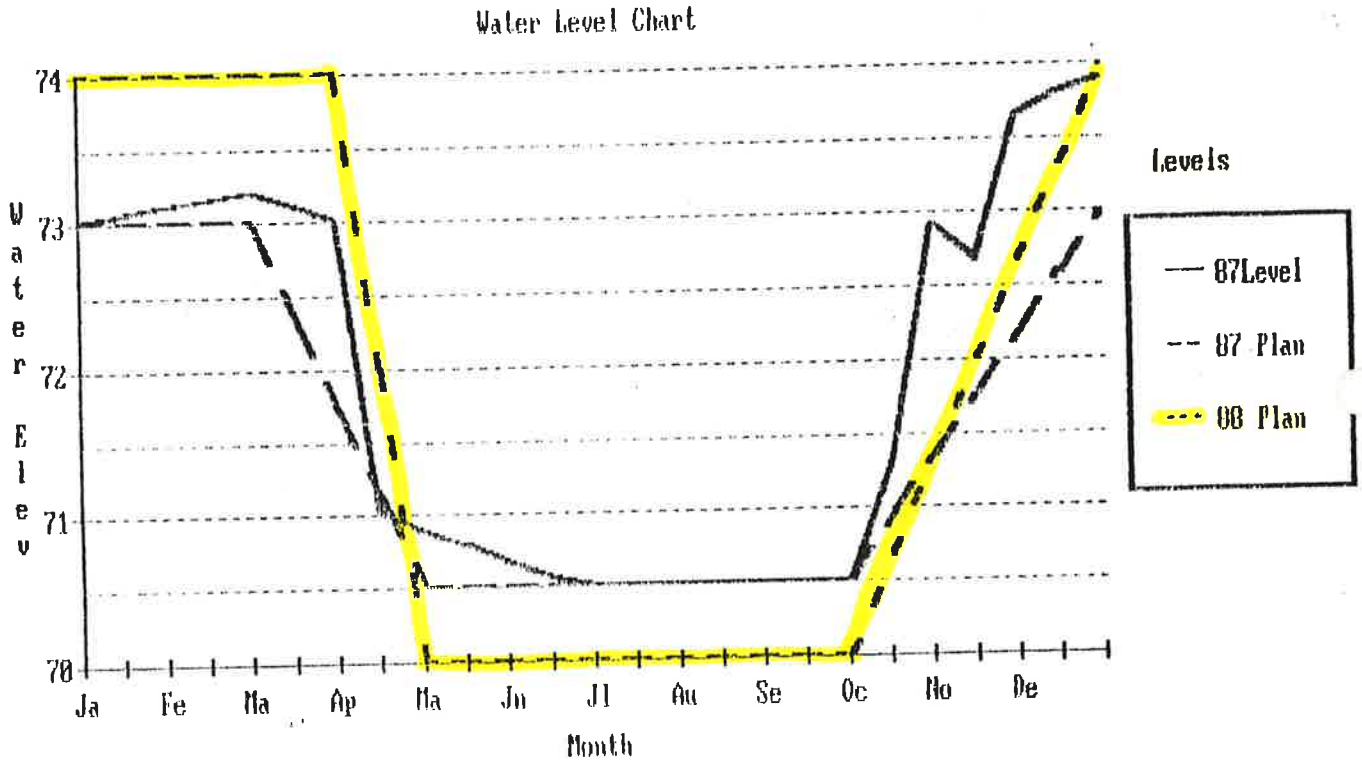
Facilities: The N dike is badly eroded and is scheduled for resloping and rip rapping in 1988. The repairs to the W dike were completed this spring. A flap gate was installed on the WCS in November.

Costs: A flapgate was installed on the water control structure after the water that could not be gravity drained was removed with a three inch pump.

B.2 Objectives of the 1988 Proposed Water Levels

Allow to gravity drain until May, then use Crisafulli pump to finish the drawdown to complete dike repairs and riprap the N dike. Once repairs are completed, permit precipitation to slowly build up levels until fall and then partially fill.

1. Unit MSU 3
2. Acres 213
3. Maximum elevation permissible 574.5
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Emergents	70	70	75
Open Water	10	10	0
Smartweed/Millet	5	5	20
Bidens/Cottonwood	15	15	5

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	650,000	500,000	400,000
Geese	225,000	100,000	275,000
GBH	4,000	5,000	1,500

9. Purple Loosestrife: Infestation suspected - area not surveyed due to thick vegetation and time limitations.

MSU-3

A.2 Effects of Past Year's Water Levels

Levels: This unit was drawn down by April 15th, and held dry until November, when three feet of water was pumped in between the first and the thirteenth.

Results: There was an excellent response to the drawdown with a good interspersion of cattail, smartweed, millet, bullrush, and burreed. Twenty- eight acres were plowed, disced, and planted to millet in late summer to kill the larger patches of cottonwood. After construction was finished on the North dike and the area was reflooded, the unit was used heavily as a roosting and feeding area for ducks and geese. Waterfowl use would have been even higher if the unit could have been flooded sooner.

Facilities: The north dike along Tank ditch and the south half of the west dike were resloped in early fall, but have not been rocked yet. The rest of the dikes are scheduled for repair in 1988.

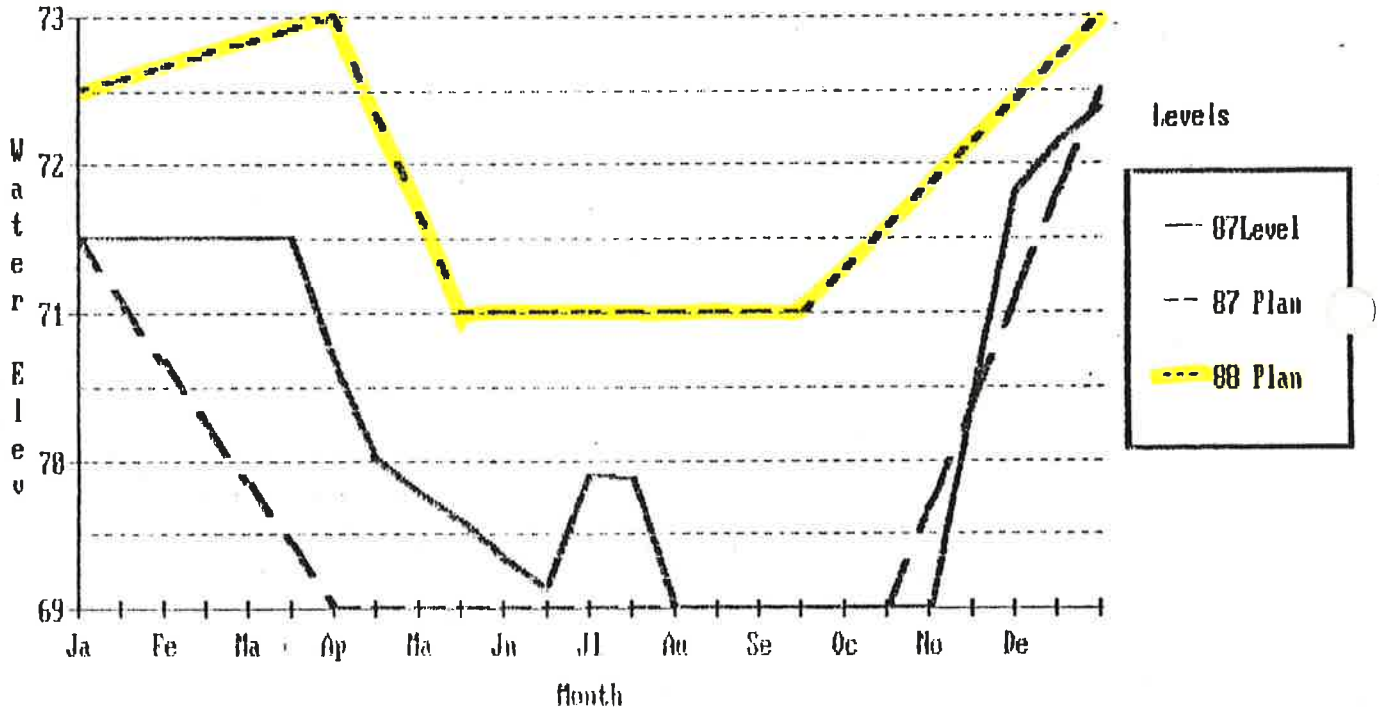
Costs: All dikes were mowed once and the estimated electric pumping costs $1,200. The 30 acre area was mowed by a volunteer and millet planted by a coop. farmer.

B.2 Objectives of the 1988 Proposed Water Levels

A complete drawdown by early May for high priority construction on all dikes. Part of the area will be cooperatively farmed and planted in millet to mechanically disturb the soil to control cottonwood expansion. If dike repairs are finished, the area will be flooded for fall migration.

1. Unit MSU 4
2. Acres 106
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Reed Canarygrass/Willow	65	3	3
Cattail/Willow	20	1	0
Millet/Bidens/Smartweed	15	1	12
Agriculture	0	90	75
Borrow	3	5	5

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	20,000	5,000	15,000
Geese	25,000	150,000	30,000
GBH	500	100	250

9. Purple Loosestrife: None noted.

MSU-4

A.2 Effects of Past Year's Water Levels

Levels: The unit was drawn down in April and kept dry until late fall when precipitation filled the ditches and flooded lower lying areas.

Results: Objectives for the year were to ensure the elimination of the reed-canarygrass, willow, and cattail invasion that had just about claimed the entire unit. The unit had been burned, mechanically disturbed, and planted last year. This year the entire unit was cooperatively farmed and planted in soybeans and sorghum. The soybean acres were then disced to kill any remaining sprouts. By this fall, only a few sprouts around the edges could be seen. The unit was not flooded for the fall migration, but the geese fed heavily after the soybeans where harvested.

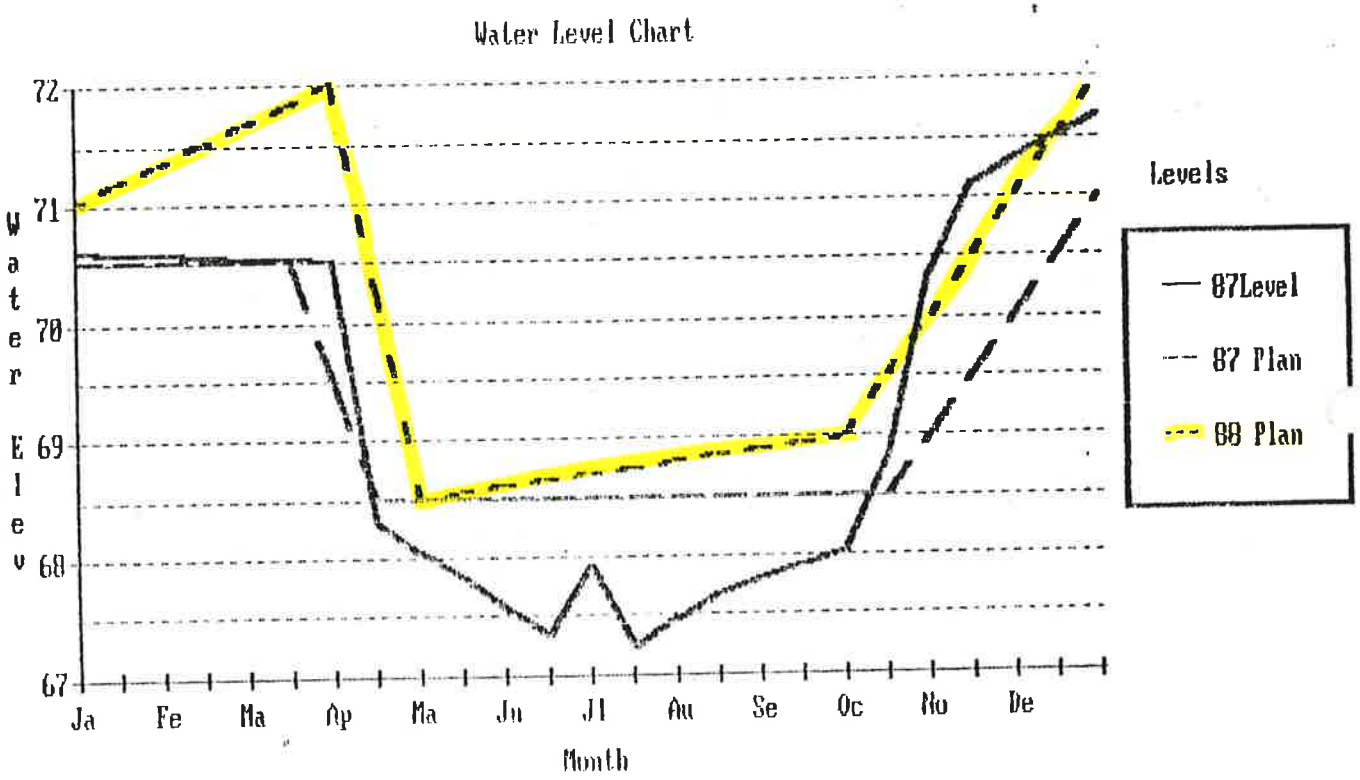
Facilities: About 1/2 of the W MSU 3-4 common dike was repaired on the MSU-4 side in 1986. The N & W dikes are in good shape. The remaining 1/2 of the W dike and the S dike need repairs and rip-rap.

Costs: Electricity to run the Moist soil pump cost approximately $900.

B.2 Objectives of the 1988 Proposed Water Levels

Drawdown to wet to moist stage to allow the MSU 3-4 common dike and S dike to be repaired. Eventually, with the elimination of reed-canarygrass and willow, and completion of the dike work, the unit will return to a productive moist soil unit. Reflood when construction is completed.

1. Unit MSU 5
2. Acres 250
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 567
5. Water Elev. with 50% bottom exposed - 570.5
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Millet/Smartweed	15	30	6
Agriculture	0	30	80
Bidens	45	5	0
Cattail/Reed Canarygrass	5	5	5
Cottonwood/Willow	35	30	5
Velvet Leaf	0	0	4

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	450,000	100,000	350,000
Geese	240,000	300,000	290,000
GBH	2,500	1,000	500

9. Purple Loosestrife: None noted.

MSU-5

A.2 Effects of Past Year's Water Levels

Levels: The unit was drawn down in April and kept dry until fall when it was reflooded by gravity for waterfowl use.

Results: Objectives were to eliminate willow, cattail and reed canarygrass invasion that was taking over the entire unit. The unit was molboard plowed, disced twice and planted to 120 acres of beans and 80 acres of Japenese millet later in the year. The Japenese millet production was moderate with geese eating most of it. A wet June and poor drainage drown approximately 80 acres of the beans. The entire area was well used by ducks and geese after the soybeans were harvested and the unit reflooded. Cottonwood and willow sprouts still occurred throughout the unit, coming up with the crops.

Facilities: All facilities are in good shape except the south slope of the north dike needs rip rap, which is scheduled to be done in 1988.

Costs: The north dike was disced, cultipacked and seeded in reed canarygrass. Electricity to run the moist soil pump cost approximately $1500 for the year.

B.2 Objectives of the 1988 Proposed Water Levels

Drawdown to wet to moist stage to allow the north bank to be rocked. The drawdown will be completed by May first and any willow and cottonwood seedlings will be weed wicked to kill them. After construction is finished, the area will be reflooded with water from MSU 3 to a moist to just wet condition.

1. Unit MSU 6
2. Acres 70
3. Maximum elevation permissible varies with lake
4. Flowline elevation of lowest structure None
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed -

Water level varies with lake - no chart

7. Vegetation:

Species	%1985	%1986	%1987
Cottonwood/Willow	35	35	40
Other Upland	10	10	5
Cattail	50	50	50
Other	5	5	5

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	1,000	5,000	3,000
Geese	100	1,000	1,500

9. Purple Loosestrife: None noted.

MSU 6

A.2 Effects of Past Year's Water Levels

Levels: No actual water control is possible due to eroded dikes which allow the area to fluctuate with the lake.

Results: Lower lake levels during the latter part of the year discouraged muskrat cabin building, resulting in a very dense cattail stand.

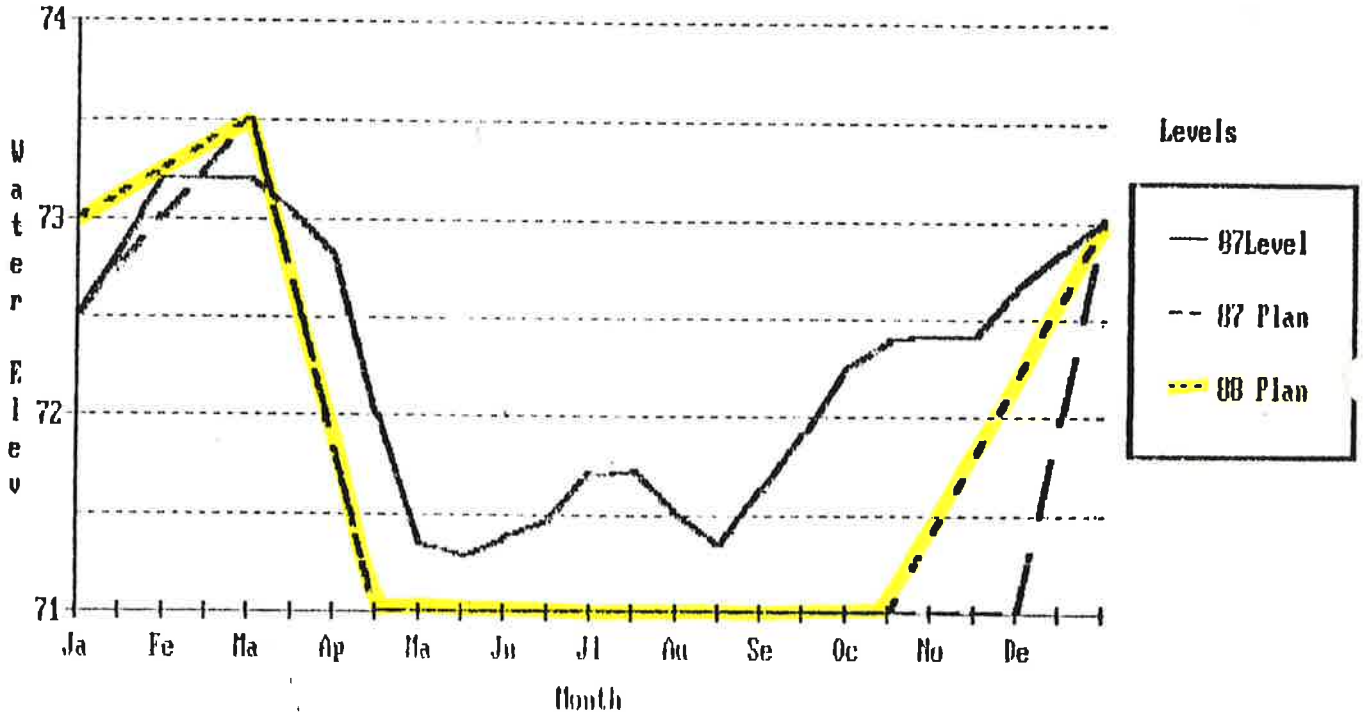
Facilities: Both the north and south dikes need complete rebuilding to make this a functional unit. Minor extension of inlet/outlet culverts to the moist soil pump are all that's needed to provide active water level control.

B.2 Objectives of the 1988 Proposed Water Levels

None

1. Unit MSU 7A
2. Acres 49
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 570.5
5. Water Elev. with 50% bottom exposed - 572.0
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Upland Species	40	20	30
Cattail	5	5	0
Millet	10	30	25
Bidens	40	40	45
Smartweed	5	5	0

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	15,000	20,000	22,000
Geese	10,000	30,000	45,000
GBH	1,500	1,000	600

9. Purple Loosestrife: Scattered plants in one centralized location. Sprayed with backpack sprayer.

MSU 7A

A.2 Effects of Past Year's Water Levels

Levels: Water levels were held stable until April first and drawndown to dry by early May. Construction of Stange Road bridge access required the unit be kept dry in fall. Precipitation gradually filled the unit by early winter.

Results: Succession replaced many annual plants with swamp milkweed, aster, and cocklebur becoming dominant in several areas. The area was mowed by the State for goose hunting season. After the hunting season, the area was utilized by ducks and geese as a roosting/feeding area for a short period of time.

Facilities: The dike is eroding rapidly due to high lake levels. Some areas of the dike are barely 3 feet wide. Reconstruction of the dike is scheduled for 1988. The pump ditch is also in need of cleaning to remove silt.

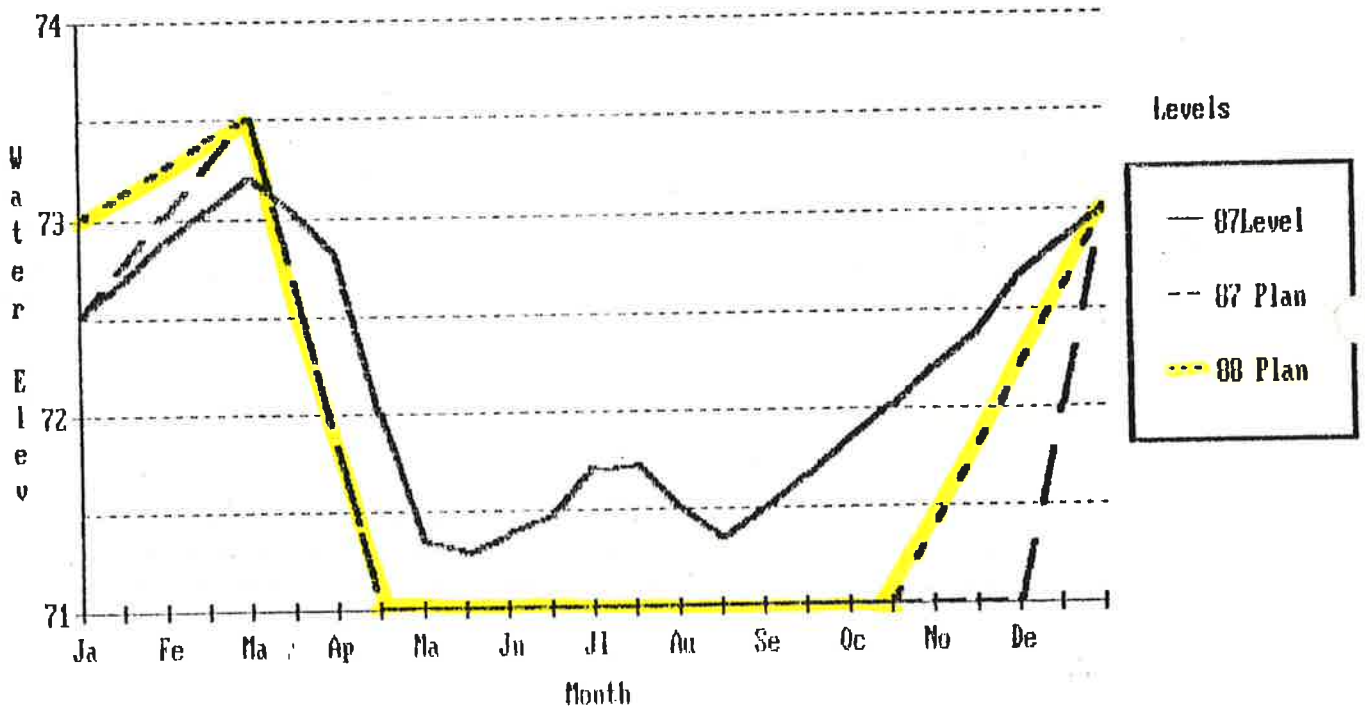
Costs: Pumping in April cost approximately $40 in electicity. The west and south dikes were mowed twice.

B.2 Objectives of the 1988 Proposed Water Levels

Complete drawdown for construction work on north dike and cooperative farm part of the unit. Millet will be planted.

1. Unit MSU 7B
2. Acres 44
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure None
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Upland	27	35	40
Aquatic Smartweed	11	10	0
Smartweed/Millet	11	15	15
Bidens	14	30	35
Agriculture/Millet	27	0	0
Cottonwood/Willow	10	10	10

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	12,000	10,000	15,000
Geese	20,000	15,000	30,000
GBH	1,000	500	500

9. Purple Loosestrife: A few scattered plants sprayed.

MSU 7B

A.2 Effects of Past Year's Water Levels

Levels: Water levels were held stable until April first and drawn down to dry by early May. Construction in fall of Stange Road bridge access required the unit be kept dry in fall. Precipitation gradually filled the unit by early winter.

Results: Succession replaced many annual plants with swamp milkweed, aster, and cocklebur becoming dominant in several areas.

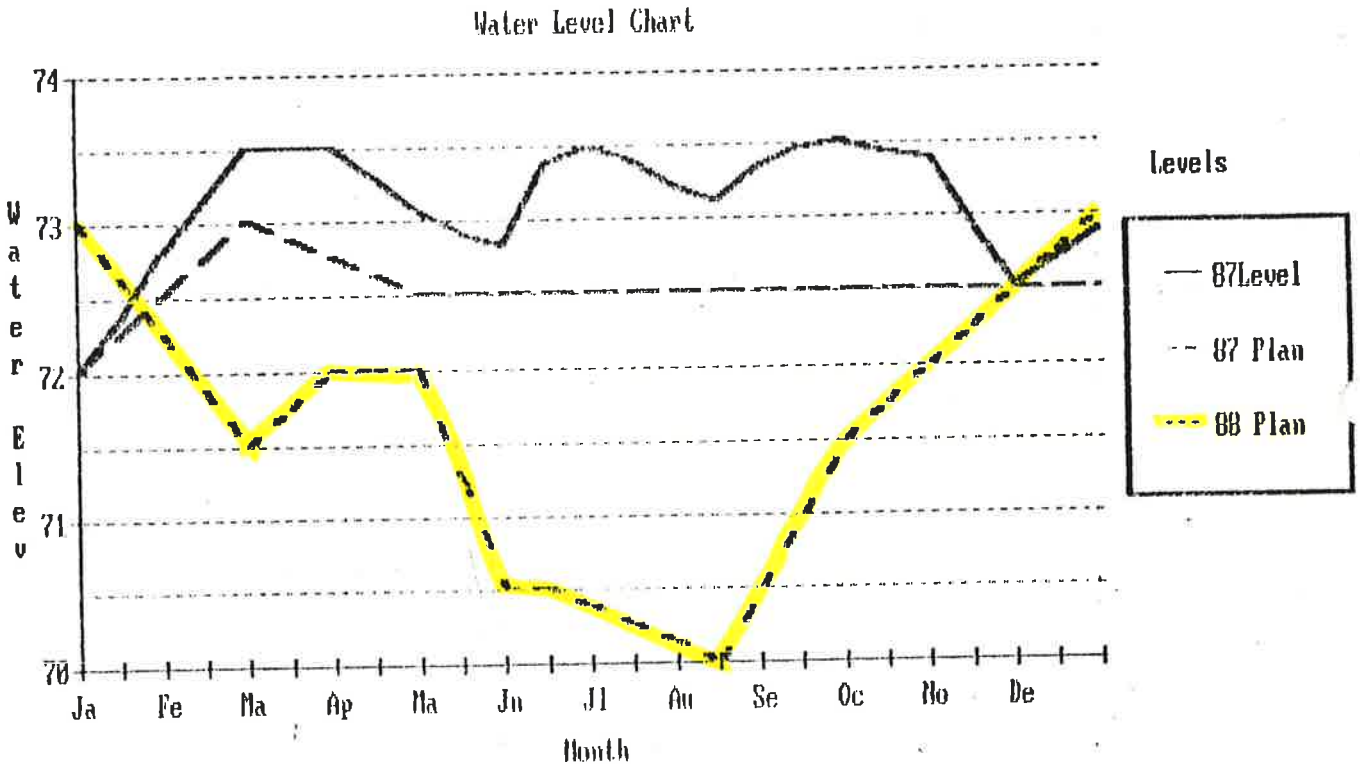
Facilities: The north dike is eroding rapidly due to high lake levels. Some areas of the dike are barely three feet wide. Reconstruction of the dike is scheduled for 1988. The pump ditch is also in need of cleaning to remove silt.

Costs: Electricity to run the farm pump cost approximately $40. (This unit drains through 7A, there is no pump that drains 7B directly.)

B.2 Objectives of the 1988 Water Levels

Drawdown to implement construction on north dike and locate barrow pit in the unit. Unit will be cooperatively farmed.

1. Unit MSU 8A
2. Acres 44
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 570
5. Water Elev. with 50% bottom exposed - 571.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1985	%1986	%1987
Agriculture (Buckwheat)	64	0	0
Millet/Smartweed	26	40	11
Bidens	2	30	8
Cottonwood Seed./(Open Water)	0	2	70
Upland Spp.	0	10	11
Cottonwood/Willow	10	10	0

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	100,000	120,000	30,000
Geese	40,000	30,000	35,000
GBH	1,000	1,000	2,500

9. Purple Loosestrife: Two first year plants found and pulled.

MSU 8A

A.2 Effects of Past Year's Water Levels

Levels: Water levels were kept as high and stable as possible until early November when water was pumped out of MSU 8A and into MSU 8B to flood 8B for the fall migration.

Results: Cottonwood stems in the lower flooded areas were stressed by the high water, but not killed. Aquatic smartweed developed in some of the shallower flooded areas. The 10 acres that were not flooded had a mixture of 3 kinds of millet, bidens, aster, cattail and bulrush, as well as other moist soil plants. Several broods were raised in this unit, including two woody broods, one mallard, and a pied-billed grebe brood.

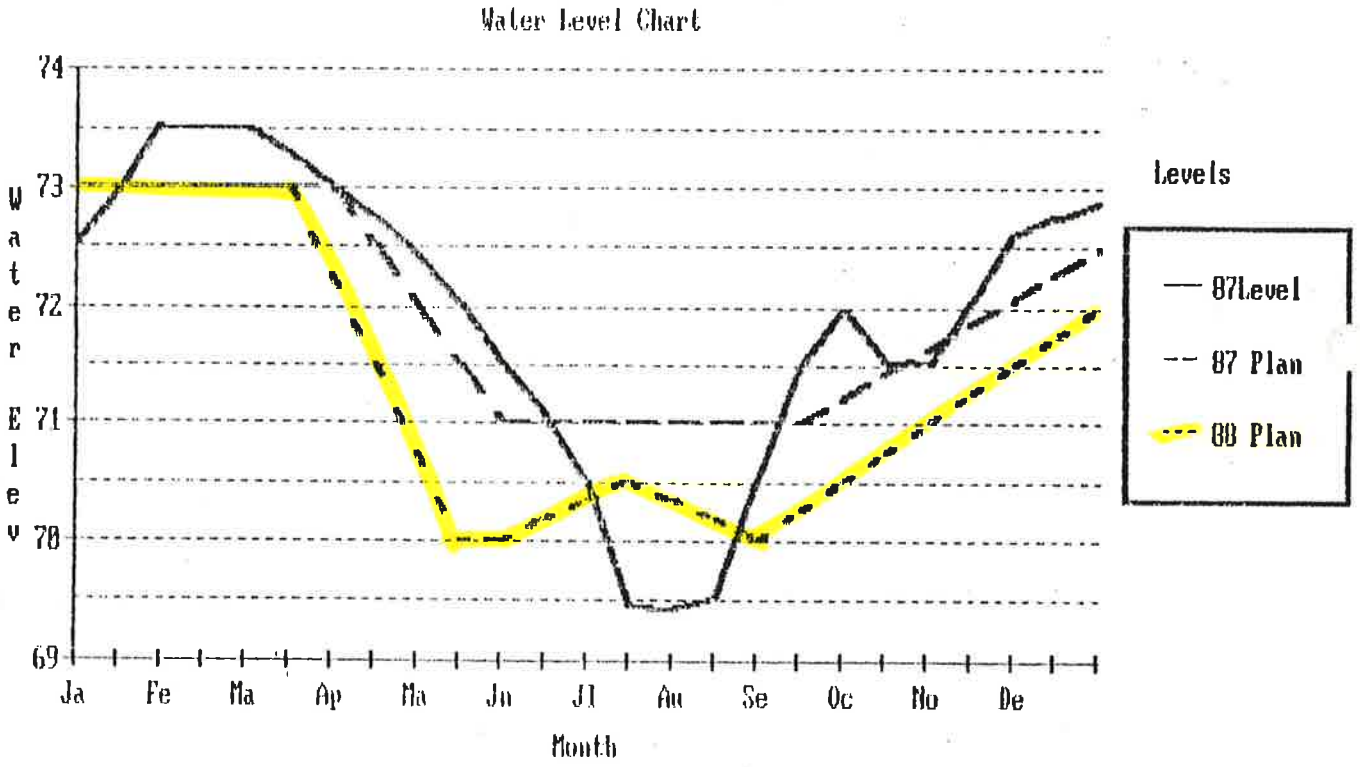
Facilities: The pump unit needs a new housing and other improvements. The SW and W dikes are eroding and in need of repair. The pump well needs to have silt removed to make the pump more functional.

Costs: None

B.2 Objectives of the 1988 Proposed Water Levels

Drawdown by late May while still maintaining water in the ditch. Unit should be kept wet to sloppy and all tree seedlings weed wicked.

1. Unit MSU 8B
2. Acres 85
3. Maximum elevation permissible 572.5
4. Flowline elevation of lowest structure 571.5
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Millet (+ velvet leaf)	76	70	(33)
Bidens	6	15	55
Upland Species	6	10	6
Agriculture	12	0	0
Cocklebur	0	5	6

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	150,000	160,000	75,000
Geese	12,000	20,000	35,000
GBH	3,000	2,000	1,000

9. Purple Loosestrife: Four individual plants sprayed.

MSU 8B

A.2 Effects of Past Year's Water Levels

Levels: Drawdown was completed in May with dry conditions prevailing until heavy rains started to fill the pool in late August. Water was pumped into 8B from 8A in early November.

Results: The south half, that was disced in June, developed a moderate stand of velvet leaf that stunted the growth of the millet beneath. Upper areas developed a mixed stand of millet, aster, and bidens. Unfortunately, this unit was kept too dry during the summer. If more water had been added in June after the area was disced, the velvet leaf would not have prevailed long enough to stunt the millet. However, the unit did attract several hundred ducks and geese after it was flooded in the fall.

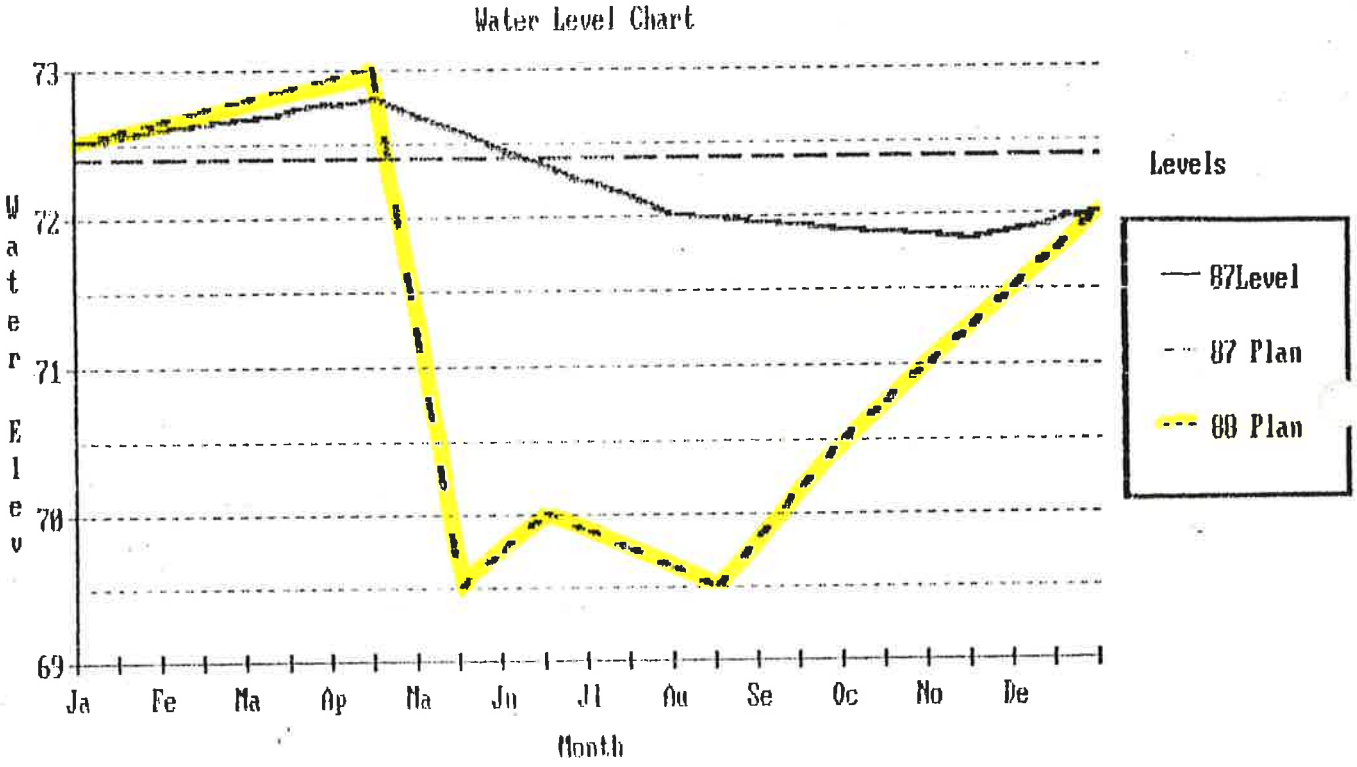
Facilities: Minor erosion is a problem along the N dike. All other facilities are in good shape. Several drain tile were found and broken in November to keep the unit from draining.

Costs: Crisafulli pumping to fill the unit cost approximatly $1,000 dollars this fall. The elctricity to pump out the unit in the spring was $540.00. Half of the unit was disced this spring by the staff at a cost of approx. $100.

B.2 Objectives of the 1988 Proposed Water Levels

Gradually drawdown until the middle third is just dry enough to disc. Raise water level until the entire unit is moist to wet after discing is completed. Allow to rise with precipitation and fall with evaporation through summer, and gradually filling in September-October.

1. Unit Mini Marsh
2. Acres 16
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 571
5. Water Elev. with 50% bottom exposed - 570.5
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	10	10	10
Cattail	80	40	40
Other	10	10	10
Dead Cattail/(Submergents)	0	40	(40)

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	1,000	8,000	10,000
Geese	500	2,000	750
GBH	400	200	1,000

9. Purple Loosestrife: None noted.

Mini-Marsh

A.2 Effects of Past Year's Water Levels

Levels: Water levels were held stable and high through the year to open dense cattail.

Results: High water levels have bared the eastern half of the unit of emergent vegetation and opened up parts of the other half. Excellent emergents developed in the open water part attracting several hundred widgeon and gadwall in October.

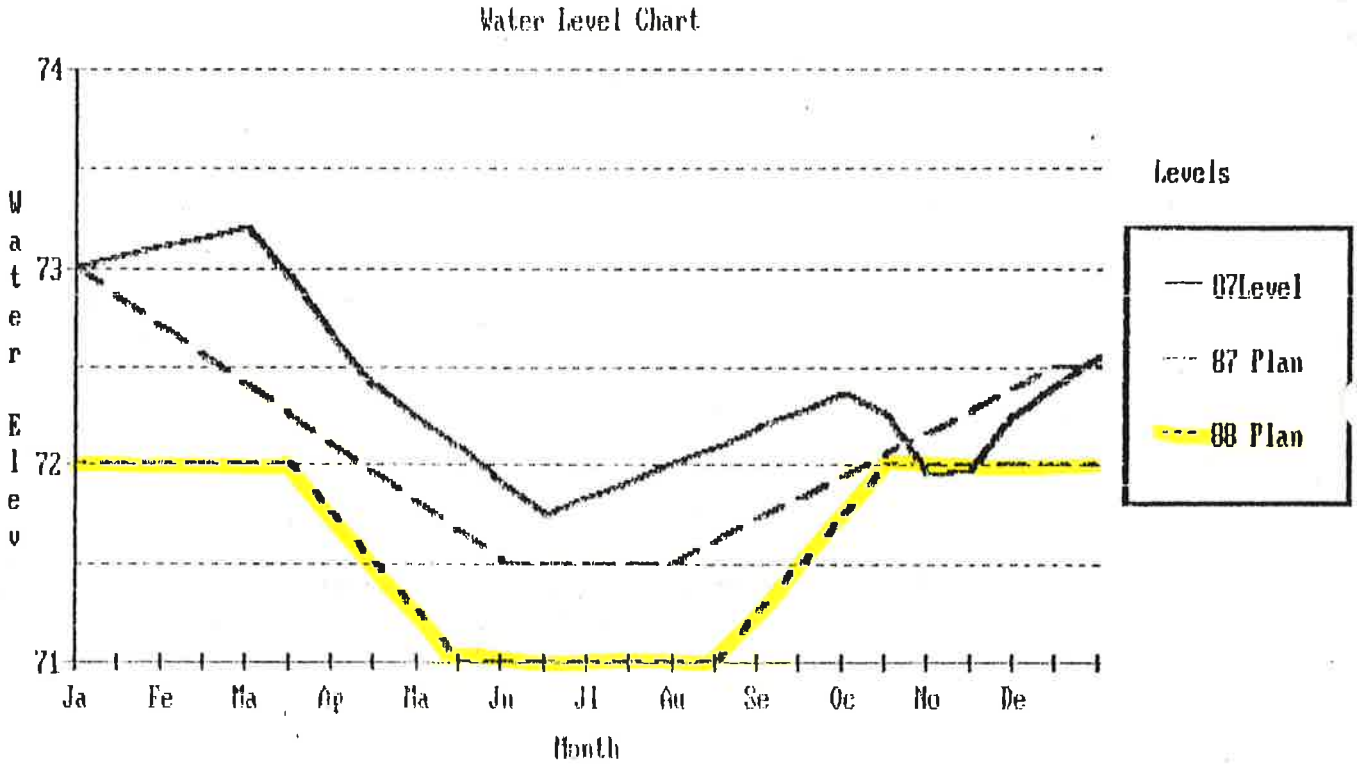
Facilities: The N and E dikes are severely eroded and not safe for vehicle travel. The S and W dikes are riddled with woodchuck and muskrat holes and are not safe for walking. The pump needs repair and is nonfunctional. Any pumping is accomplished by portable pump.

Costs: All dikes were mowed once.

B.2 Objectives of 1988 Proposed Water Levels

Gravity drain in early May to mudflats so that moist soil plants can germinate. Let precipitation shallow flood the area after germination. Pumping facilities are not working, however, the lake may be down enough to gravity drain most of the water and use portable pump to drain the rest.

1. Unit Cedar Point - Pool 1
2. Acres 1,460
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	35	50	45
Water Lily	15	20	10
Cattail	20	10	20
Burreed	10	5	5
Other	20	5	10

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	800,000	600,000	560,000
Geese	140,000	100,000	110,000
GBH	30,000	15,000	16,000

9. Purple Loosestrife: Infestation increasing throughout pool due to lower water. Spraying done from airboat and truck sprayer.

Cedar Point - Pool 1

A.2 Effects of Past Year's Water Levels

Levels: Water levels were above planned levels except for a short time in fall. Drainage by gravity was not possible in the beginning of the year, and unneccessary in the latter half. Water was added in the fall by gravity drainage for the fall migration and trapping season.

Results: Areas that had been drowned out last year re-established emergents as was planned. However, there was no noticable increase in submergents because of wave action and carp. The unit continued to attract thousands of ducks during the migration, and served as a stop over for several small groups of Whistling swans. Three immature snowy owls were also observed on the N dike in early December.

Facilities: High water levels are beginning to cause internal erosion of dikes along the north, southwest and south dikes. The drainage canal between the Pheasant Farm and Pool 1 is severely eroded. Several miles of road are in need of gravel and become difficult to travel during wet weather.

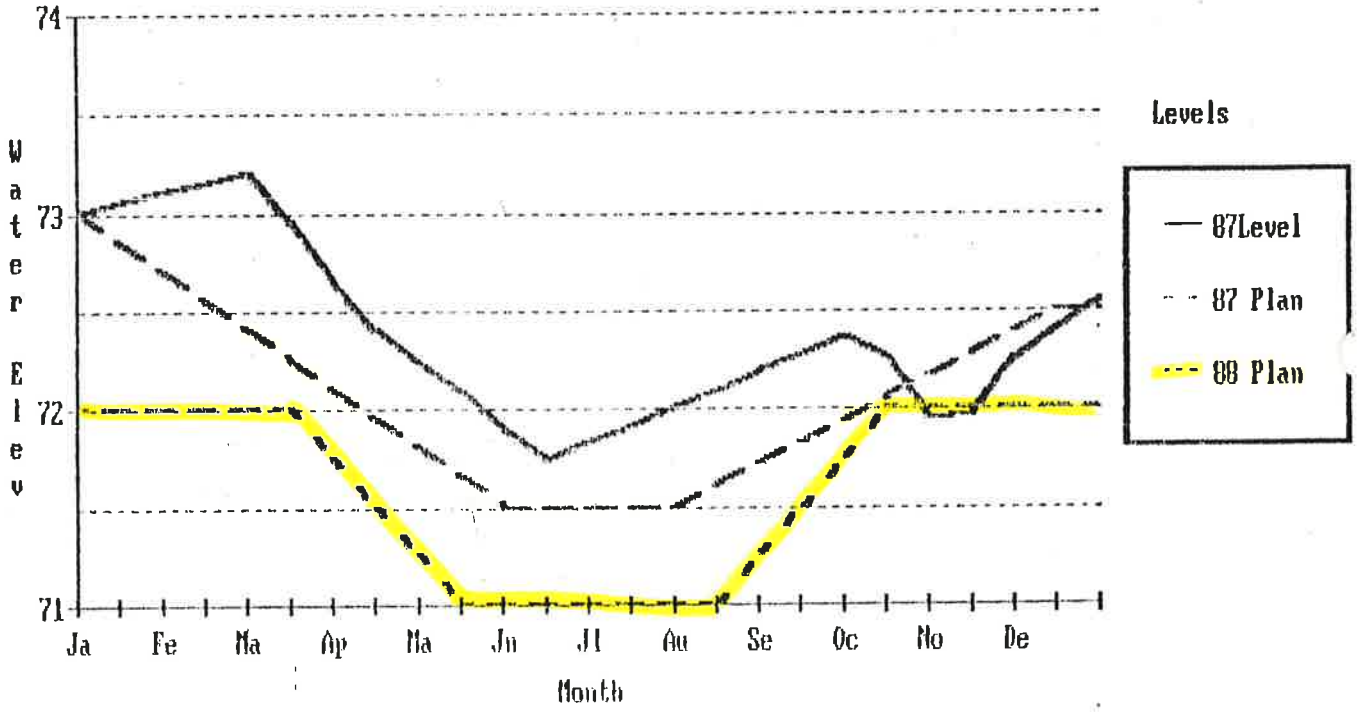
Costs: All dikes were mowed once.

B.2 Objectives of 1988 Proposed Water Levels

Water level will be lowered to planned level by mid to late May to encourage emergent vegetation. Evaluate germination in June. Precipitation will be allowed to raise water levels to improve access for purple loosestrife control in mid to late summer. The lower water levels will encourage purple loosestrife.

1. Unit Cedar Point - Pool 2
2. Acres 135
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 569.4
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	60	65	65
Cattail	25	20	20
Bulrush	5	5	5
Burreed	5	5	5
Other	5	5	5

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	50,000	55,000	78,000
Geese	20,000	20,000	10,000
GBH	5,000	5,000	4,100

9. Purple Loosestrife: Moderate infestation sprayed with truck sprayer and airboat.

Cedar Point - Pool 2

A.2 Effects of Past Year's Water Levels

Levels: Water levels were above planned levels in the fall. Drainage by gravity was not possible this spring because of high lake levels and the high cost of Crisafulli pumping.

Results: Areas that had been drowned out last year reestablished emergents as planned. There were good submergents in the open water. Phragmites is starting to dominate large areas that were once cattail.

Facilities: The dikes are in good condition with only slight erosion noted.

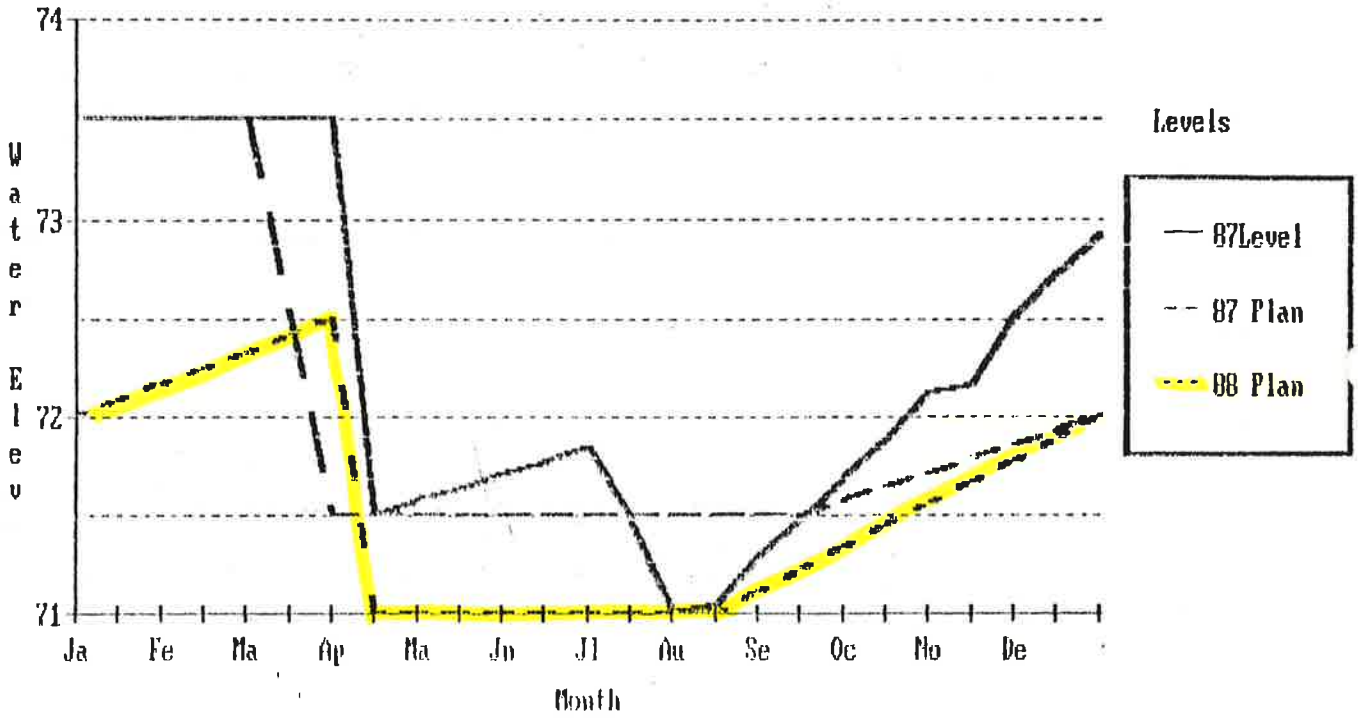
Costs: Mowing only.

B.2 Objectives of 1988 Proposed Water Levels

Pool will be drained to planned low by Mid to late May to encourage emergent vegetation. Evaluate vegetation germination in June by running transects. Precipitation will be allowed to raise the water level to improve access for purple loosestrife control.

1. Unit Cedar Point Pheasant Farm
2. Acres 155
3. Maximum elevation permissible 574
4. Flowline elevation of lowest structure 571
5. Water Elev. with 50% bottom exposed - 571
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Cattail	50	20	60
Open Water (submerg. aquatics)	30	70 (35)	25
Burreed	10	5	5
Arrowhead	10	5	5
Smartweed/Millet			5

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	150,000	90,000	40,000
Geese	30,000	20,000	4,000
GBH	10,000	15,000	2,000

9. Purple Loosestrife: Infestation increased due to low water- large areas carpeted with first year plants.

Cedar Point - Pheasant Farm

A.2 Effects of Past Year's Water Levels

Levels: Water Levels were lowered 2' in April to stop the severe erosion occurring on the internal dikes. Water was added during November to improve waterfowl access and trapping access.

Results: The response to the drawdown was excellent with a good interspersion of millet, smartweed, arrowhead, cattail, and other emergents revegetating all of the higher areas. Unfortunately, the low water also improved conditions for purple loosestrife, which literally carpeted some areas. Duck use remained low in the fall because low lake levels prevented early fall flooding.

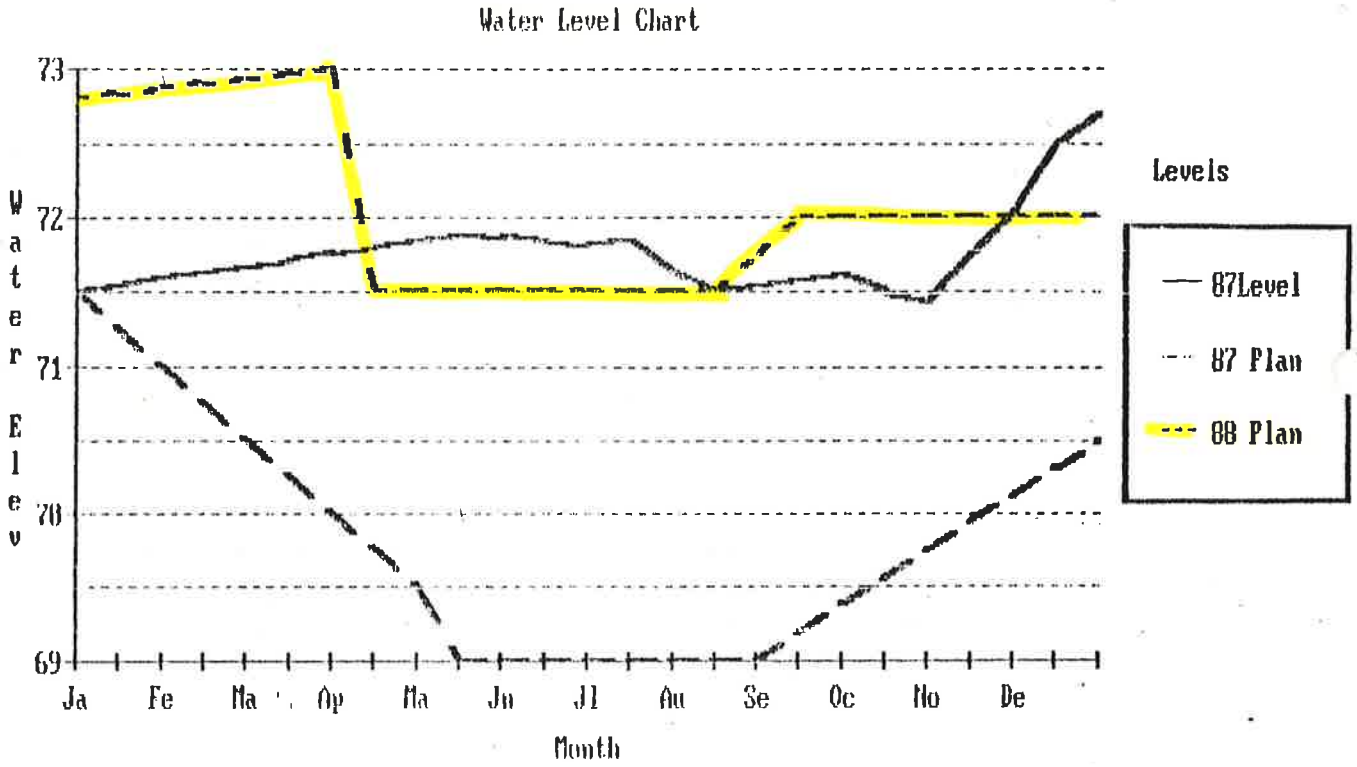
Facilities: The dikes of this unit are in poor condition with both banks of the west and east dikes severely eroded. The south bank is eroded only on the inside and the north dike is in good shape. Rust has rendered the water control structure on the east dike non-functional with it leaking with each rise and fall of the lake. Reconstruction of the dikes is expected to be done in 1989, but could be started as soon as fall 1988.

Costs: All dikes that were wide enough were mowed once. Crisafulli pumping in the spring cost $8,000. The pump was run 24 hours a day, 7 days a week for two weeks to take the water off quickly. This one pumping job consumed a major portion of the budget money tagged for pumping.

B.2 Objectives of 1988 Proposed Water Levels

Begin partial drawdown in early March as soon as the ice is gone to get water off the face of eroding dikes. This will encourage purple loosestrife in an already heavily infested area. Levels will be kept high as possible up to the point that does not result in further dike damage.

1. Unit Darby - Pool 1
2. Acres 200
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 566
5. Water Elev. with 50% bottom exposed - 569
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	40	50	20
Water Lily (Pickerel weed)	20	25	(50)
Bulrush	10	5	5
Burreed	10	10	5
Cattail, Bluejoint, Other	10	10	20

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	175,000	90,000	94,000
Geese	70,000	20,000	30,000
GBH	5,000	8,000	5,000

9. Purple Loosestrife: Moderate infestation with scattered individuals throughout unit. Sprayed with airboat and backpack sprayers. Most plants mixed with tall grasses on West and Southwest areas.

Darby - Pool 1

A.2 Effects of Past Year's Water Levels

Levels: The pool was not drawn down as planned due to high lake levels in spring and the high cost of pumping. The surface elevation stayed between 571 and 572 during the year until precipitation filled it to 572.5 in December.

Results: Some areas on the SE side began to revegetate as evaporation lowered the water level to expose the higher areas this summer. Water lilly and pickeral weed continue to dominate many canals and open water areas. Dense stands of submergents were present throughout the unit. These submergents attracted an unusually high number of ducks during migration until the hunting season started.

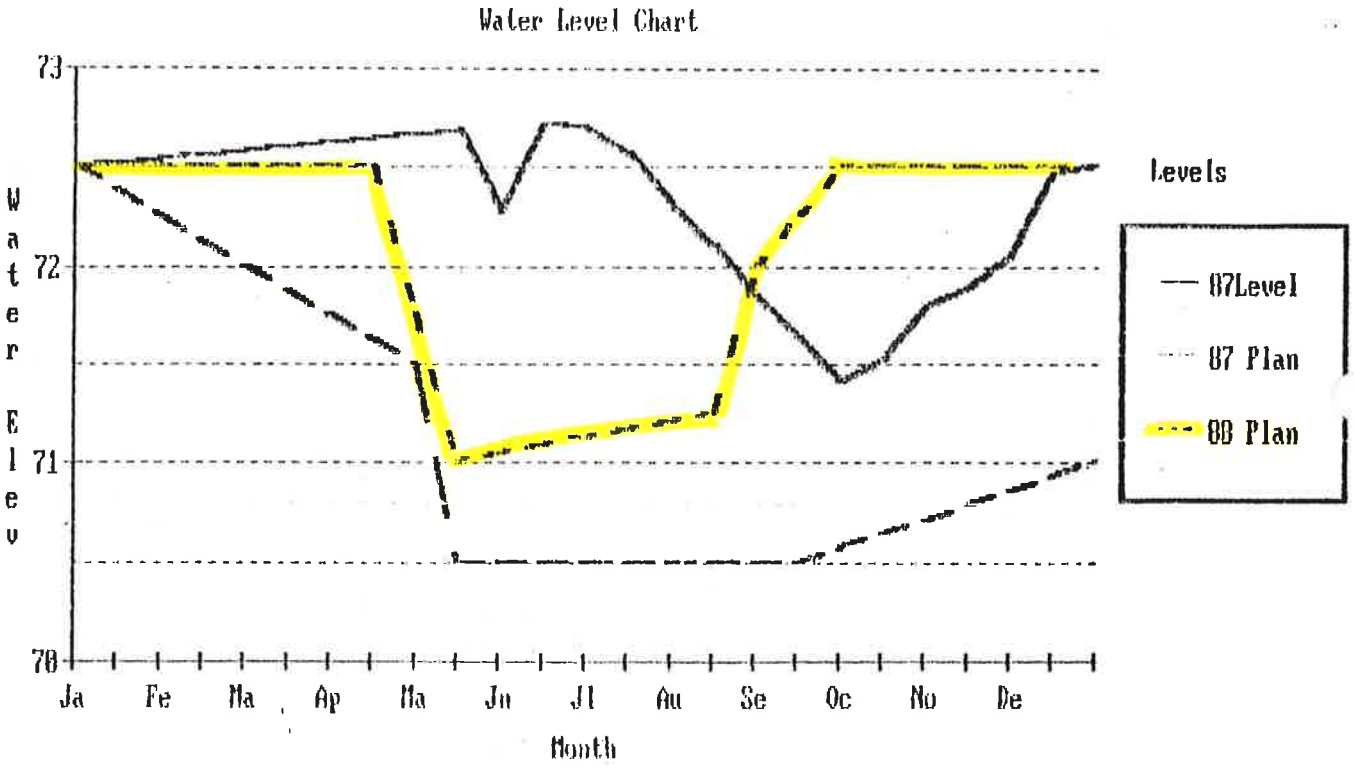
Facilities: The facilities in this unit are in good condition with the exception of the east dike, the east half of the south dike and the south bank of the south dike. All three are eroded due to high levels and are not protected by rip-rap.

Costs: All dikes were mowed once with no pumping costs incurred in 1987.

B.2 Objectives of 1988 Proposed Water Levels

A partial drawdown through July to encourage germination of emergents. Water will be added July 15th to improve access for purple loosestrife control.

1. Unit Darby - Pool 2
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water/Submergents	40	40	25
Dead Cattail/Duckweed	40	55	0
Cattail	10	5	10
Pickerel Weed	0	0	55
Other (including P. Loosestrife			10

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	10,000	7,500	5,500
Geese	1,000	3,000	100
GBH	500	2,000	850

9. Purple Loosestrife: Heavy infestation in center of unit and along south dike. Only edges sprayed because of low water and deep silt deposits.

Darby - Pool 2

A.2 Effects of Past Year's Levels

Levels: Water levels were higher than planned throughout the year. Drainage into the unit from adjacent farmland kept levels high even though some gravity drainage did occur.

Results: Desirable emergent vegetation is almost gone. Pickeral weed and purple loosestrife are taking over the unit. Dense submergents were present over much of the area and attracted several hundred widgeon in October.

Facilities: Dikes along the west and south sides are in good shape. Both slopes on the north and east dikes are eroded and without rip-rap protection. The WCS is not working properly and will require attention next year.

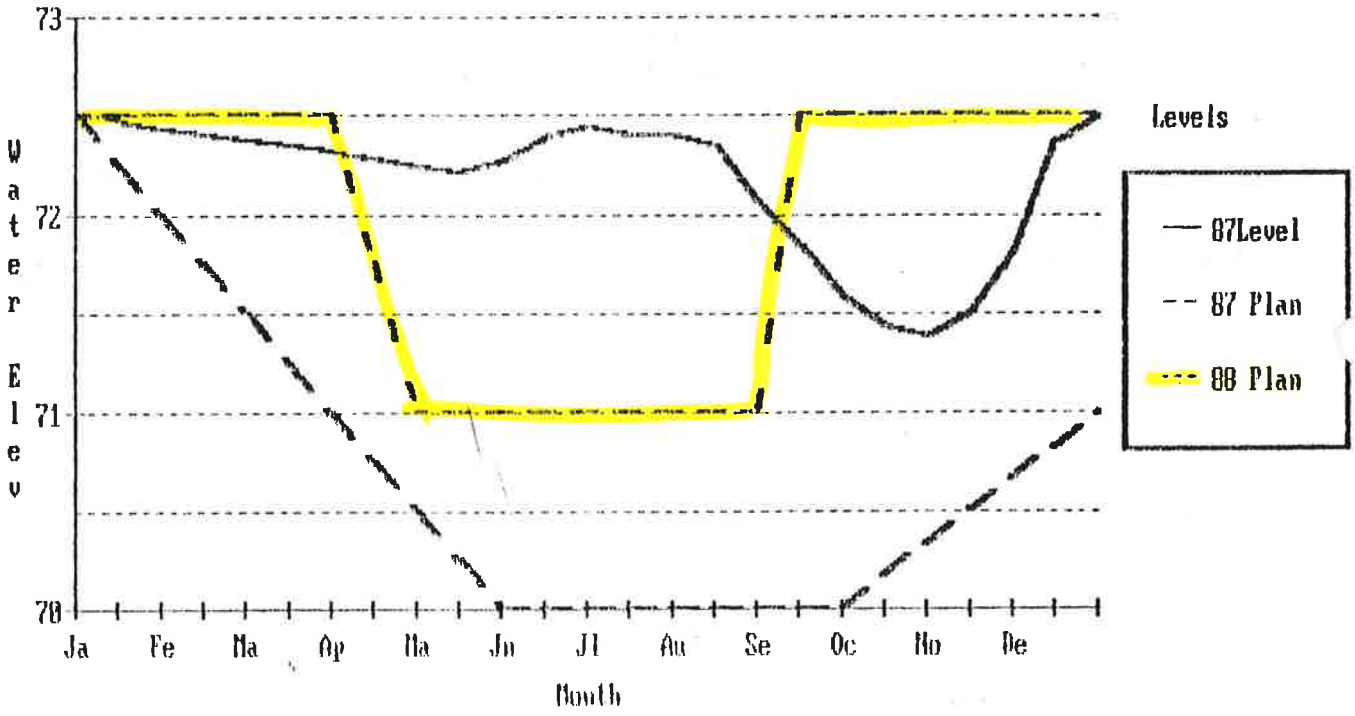
Costs: Dikes were mowed once and no pumping costs were incurred.

B.2 Objectives of 1988 Proposed Water Levels

Water will be held high to discourage purple loosestrife germination and improve access. The pump station will greatly improve our ability to manage this pool. Gravity drainage or filling is difficult when relying on the fluctuating and unpredictable lake levels.

1. Unit Darby - Pool 3
2. Acres 25
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569
5. Water Elev. with 50% bottom exposed - 570
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	90	97	98
Aquatic Smartweed	5	1	0
Other	5	2	2

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	10,000	1,000	1,050
Geese	2,000	1,500	100
GBH	200	500	450

9. Purple Loosestrife: Several individual plants on west end of borrow area sprayed.

Darby Pool 3

A.2 Effects of Past Year's Water Levels

Levels: Water levels were well above those planned with runoff from adjacent private lands and high lake levels preventing any drawdown.

Results: All vegetation is gone except for a few scattered emergents. Only a few heron, egret and teal used the pool this year.

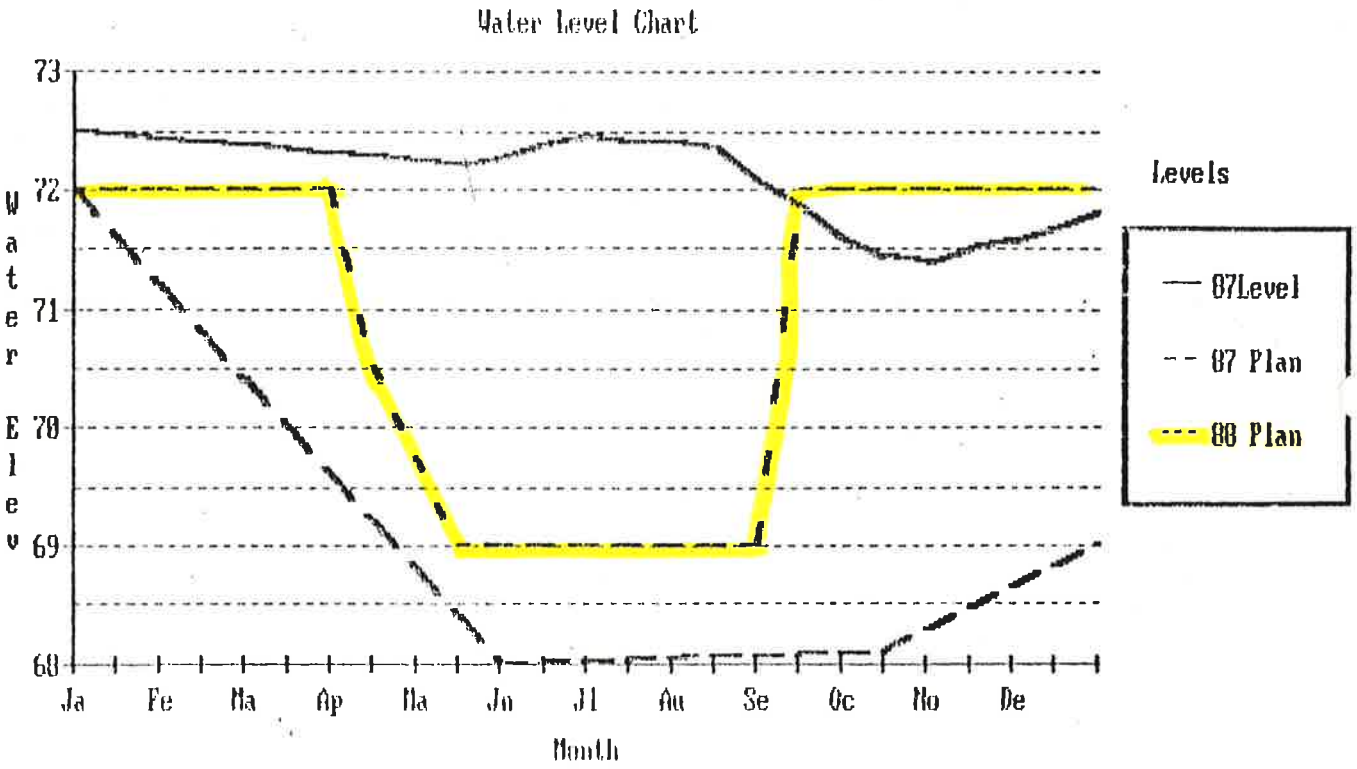
Facilities: The north, east and west dikes are eroded on both sides and need resloping and rip-rap protection. The south dike is in good condition. The water control structure is not working properly.

Costs: All dikes were mowed once.

B.2 Objectives of 1988 Proposed Water Levels

A drawdown starting with gravity draining March 15th and finish pumping out with the Crisafulli by May 15th will allow this open pool to revegetate. The new pumping station that is expected to be built in 1988 will allow for more precise management of this pool.

1. Unit Darby - Pool 4
2. Acres 170
3. Maximum elevation permissible 573.5
4. Flowline elevation of lowest structure 566.6
5. Water Elev. with 50% bottom exposed - 567.5
   90% bottom exposed - _____



7. Vegetation:

Species	%1985	%1986	%1987
Open Water	90	90	91
Water Lily	2	2	<1
Cattail	1	1	1
Cottonwood/Willow	5	5	5
Other	2	2	2

8. Wildlife Use:

	Use Days		
	1985	1986	1987
Ducks	5,000	1,500	25,000
Geese	2,000	500	1,200
GBH	500	500	1,000

9. Purple Loosestrife: Moderate to heavily infested on southern end - sprayed with backpack and truck sprayers.

Darby - Pool 4

A.2 Effects of Past Year's Levels

Levels: Water levels were well above those planned with runoff from adjacent private lands and high lake levels this spring preventing any drawdown.

Results: Only a narrow band of cattails on the south side and some water lilly on the N side were present. No submergents were noted. A few herons, cormorant, diving ducks, and mergansers were observed using the pool.

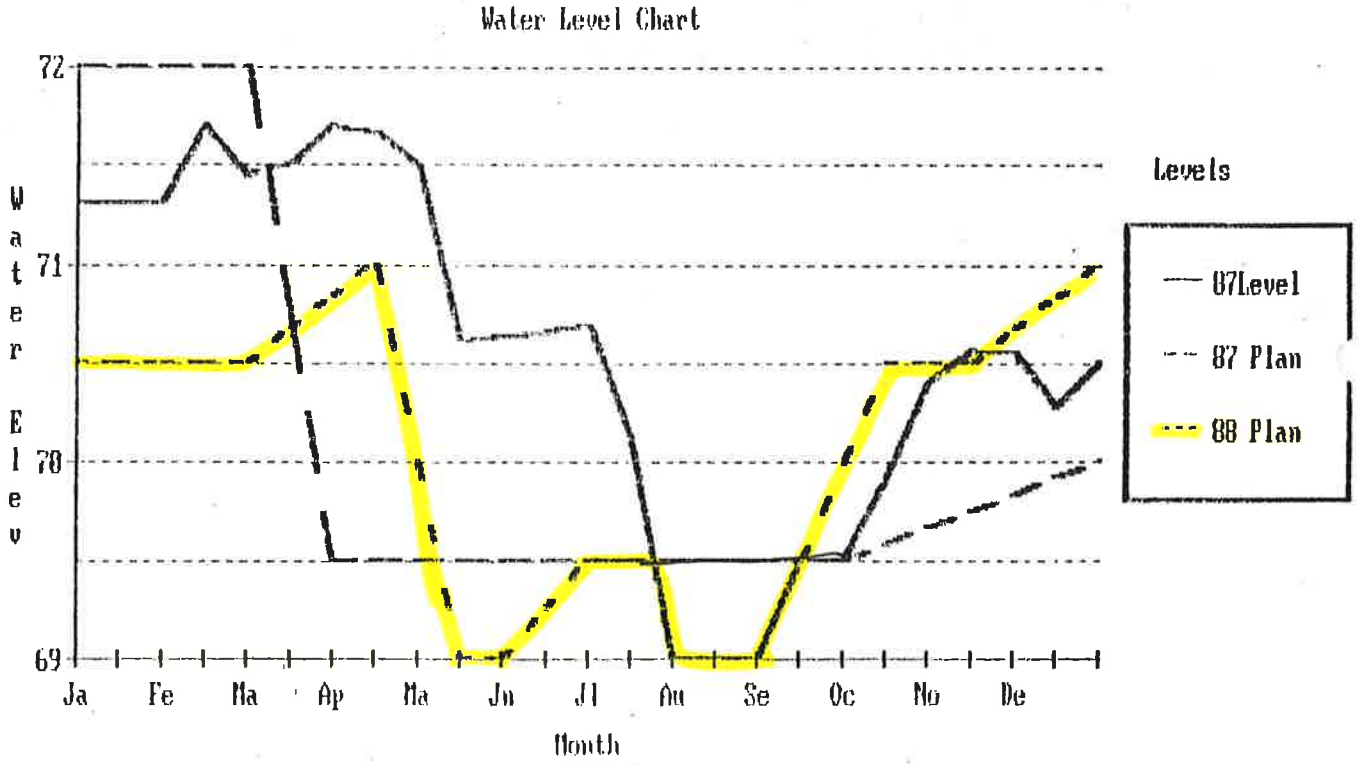
Facilities: The west and south dikes are eroded on both sides and need resloping and rip-rap protection. The north and east dikes are in good condition.

Costs: All dikes were mowed once - no pumping costs incurred.

B.2 Objectives of 1988 Proposed Water Levels

Gravity drain starting March 15th - possibly pump down if it is required for installation of pump.

1. Unit Navarre - Pool 1
2. Acres 130
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569.5
5. Water Elev. with 50% bottom exposed - 568.5
   90% bottom exposed -



7. Vegetation:

Species	%1985	%1986	%1987
Open Water/Water Lily	40	60	45
Cattail	30	20	30
Bulrush	10	5	10
Cottonwood/Willow	10	10	10
Other	10	5	5

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	40,000	50,000	47,000
Geese	20,000	100,000	38,000
GBH	2,000	10,000	6,000

9. Purple Loosestrife: Some plants reported by state, but not found.

Navarre - Pool 1

A.2 Effects of Past Year's Water Levels

Levels: Water levels were held a foot higher than planned from April until July, when it was drawndown 6" below the planned level. The unit was then allowed to fill to planned levels in November and December.

Results: Objectives of holding water high to allow muskrat opening of dense emergents and for duck brood production were partially successful. The dense cattail in much of the unit has been opened up, but a few areas remain too thick. Submerged aquatics were dense in the bay with little problem noted with water lilly.

Facilities: Only the boundary signs are maintained by the refuge.

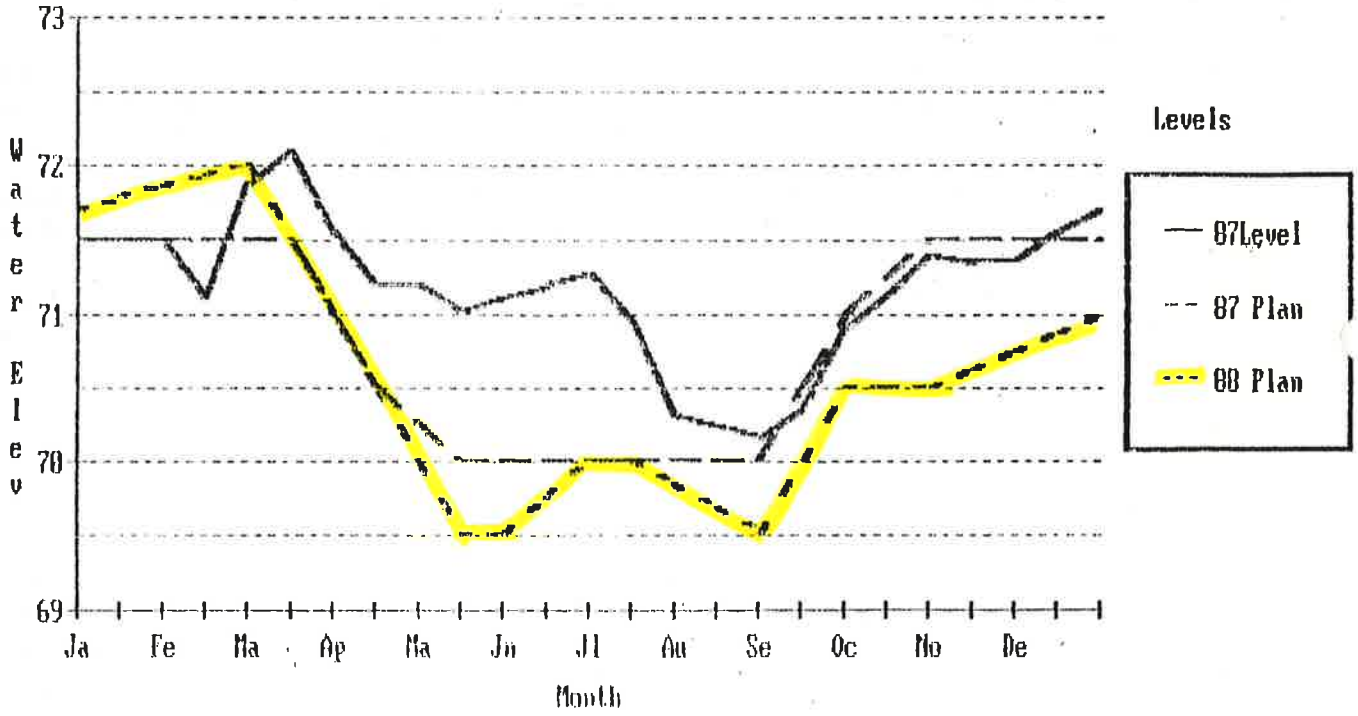
Costs: All pumping costs were paid by Toledo Edison.

B.2 Objectives of 1988 Proposed Water Levels

Drawdown until the area is soggy to wet. Evaluate after drawdown to determine vegetation response by running transects. Allow precipitation to fill the unit throughout the fall and summer. Add water in the fall if necessary.

1. Unit Navarre - Pool 2
2. Acres 340
3. Maximum elevation permissible 573
4. Flowline elevation of lowest structure 569.5
5. Water Elev. with 50% bottom exposed - 569.5
   90% bottom exposed -

Water Level Chart



7. Vegetation:

Species	%1985	%1986	%1987
Cattail	40	30	40
Bulrush	15	10	10
Burreed	10	5	5
Water Lily	20	35	30
Other	15	20	15

8. Wildlife Use:

	Use Days 1985	1986	1987
Ducks	150,000	140,000	120,000
Geese	70,000	260,000	121,000
GBH	10,000	30,000	12,000

9. Purple Loosestrife: Few individual plants pulled or sprayed.

Navarre - Pool 2

A.2 Effects of Past Year's Water Levels

Levels: Water levels were high until September when levels correlated roughly per plan.

Results: Many areas that were opened up by the muskrats remained open or were revegetated by more desirable emergents such as threestem bulrush. Excellent submerged aquatics were present in portions of the deeper bay area. Muskrats declined after last year's high population.

Facilities: Only the boundary signs are maintained by the refuge.

Costs: All pumping costs were covered by Toledo Edison.

B.2 Objective of 1988 Proposed Water Levels

Completely drawdown starting the third week in April and finish pumping by May 15th to encourage germination of annuals. Shallow flood in fall to wet everything.